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INTENSIVE AND EXTENSIVE METHODS IN FARMING.

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DEGREES OF INTENSITY IN FARMING.

IT may be noted that the terms "intensive" and "extensive" are relative in their application. Methods of farming which would be intensive for a given district as a whole might be considered comparatively extensive for that part of it in close proximity to a large centre of population. Methods of dairying which would be appropriate to the Hutt Valley might easily be far too extensive for profitable adoption in Taranaki. Even in the utilization of suburban lands methods may exhibit varying degrees of intensity, from highly forced production involving the use of glass, "made" soil, and similar artificial aids, passing to more ordinary forms of market-garden farming, still with a liberal use of hand-labour and resort to large applications of manures, and finally to methods,

extensive from the point of view of *petite culture* and intensive in relation to farming in general—viz., close rotation—for the purpose of supplying milk, forage, &c., to the city.

ECONOMIC LIMITATION OF INTENSIVE SMALL-FARMING.

It is not the purpose of this article to inquire into these phases of suburban farming, interesting though they may be, for, apart from the fact that the data are very meagre and conflicting, the subject is as yet of limited interest in New Zealand. It may be well, however, in this connection to point out the fallacy in the argument of advocates of intensive farming. Instances are cited of large profits from the high farming of a few acres, from scientific intensive poultry-farming or from fruitgrowing. The argument attracts the would-be small holder. The ranks of the producers are swelled, the demand for consumption remains constant, prices fall. The higher the average of science and skill applied under these circumstances the more unfortunate the result for the individual producer. Supply regains its normal relation to demand after a proportionate number of producers have been starved out of the business. Embarking upon fruit-farming at a time when fruit is in keen demand is always a risky enterprise, excepting where organized co-operation for export exists or may be brought about, inasmuch as capital and labour must remain unproductive for several years, and when returns begin to accrue overproduction may suddenly become manifest, to the serious loss of the growers. Market-garden produce, potatoes, and to a lesser extent cereals and hay, are all subject to the ebb and flow of underproduction and high prices, and *vice versa*. When these are staples consistent adherence to cropping-plans tends to even up returns in the long-run, and the man who would vary his cropping so as to attain uniformly high returns must combine farming ability with business acumen and instinct in no common degree.

LIMITATION OF INTENSIVE DAIRY-FARMING.

In the Press and from the platform the dairy-farmer is frequently urged to adopt more intensive methods. Continental dairy farms, with their heavy stocking and high production per acre, under soiling systems are quoted as examples to follow. Enthusiasts have been so far misled as to assert that production per acre is the final test of profitable dairying. The value of the produce and the cost of securing it are ignored. Dense consuming populations, high prices for milk, cheap and abundant labour, less fertile soils, and greater differentiation of seasons are factors justifying intensive Euro-

pean methods, just as the opposite factors militate against the possibility of success from the general adoption of such methods in young countries like Australia and New Zealand. The persistent total failure of dairying activities under semi-intense methods at the majority of Government farms in the Australian States, even allowing for the disabilities attached to the operation and management of Government undertakings, are attributable to no other cause. These farms would thoroughly justify their existence by making known their failures, and also the extent to which, as the result of their experience, intensive methods might successfully be applied under their conditions. Unfortunately, the results of experience are too often ignored, and the advocacy of so-called scientific farming continues. Certain sections of the community re-echo the questions, "Why don't you limit your pastures and grow more crops for grazing and hand-feeding?"; "Why not irrigate?"; "Have you no use for drainage, green manures, and lime?"; "Wherefore this niggardly manuring?"; "Why is not the provision of abundant supplies of hay and ensilage a part of your year's programme?" and so forth. The experienced farmer thinks there may be something in the advice; but, knowing that his own practice has not proved unprofitable, cautiously keeps to his own course. The inexperienced and the progressively inclined are persuaded to the more or less complete adoption of these methods, and usually discover, sooner or later, that their production-costs have advanced out of all proportion to their increased returns. The mischief lies in the corollary, "So much for your science!" Intensive methods, on the other hand, may generally be successfully applied to the production of city milk-supplies, with the advantage, as compared with other forms of suburban farming, that losses from overproduction are limited by the existence of export values.

INTENSIVE FARMING DESIRABLE.

It is not to be inferred from what has been written above that the writer is antagonistic to any movement in favour of concentration of effort in farming. On the contrary, it is recognized that the systematic adoption of improved methods involving the use of grazing-crops means in most districts greater profits and more progressive farming. But it is not possible for farming to outstrip surrounding economic conditions without bringing loss to the farmer. Very intensive methods should be our objective for the future. The immediate problem of the farmer is to intensify his farming up to the point of greatest profit for his conditions. It is admitted that there is a marked tendency for the average

farmer to be too indifferent to cultivation and improved methods, and our aim should accordingly be in the direction of a general but gradual improvement rather than advocacy of extremes.

PROGRESS TOWARDS INTENSIVE FARMING IN NEW ZEALAND.

The various phases through which farming in New Zealand has passed may be briefly summarized as follows :—

(1.) Pastoral occupation—the most extensive system of all; so extensive, indeed, that it ceases to be considered as agriculture in the strict sense.

(2.) The growing of cereals for the sale of grain in selected areas and districts.

(3.) The advent of refrigeration and cold storage, resulting in a combination of cropping and live-stock farming or live-stock raising and dairying on grass simply.

(4.) Subdivision into smaller areas, necessitating the growth of supplementary forage crops to increase carrying-capacity, to fatten surplus stock, or enable milk-production to be maintained at a more profitable level.

(5.) Resort to hand-feeding, such as is involved in the cutting and carting of maize, lucerne, &c., in summer and autumn, and roots in winter and early spring, together with the provision of hay and ensilage for winter feed. This practice has so far attained very small proportions, while the feeding of grain and cake can hardly be said to have any justification at all in ordinary farm practice. New Zealand occupies an altogether unique position with regard to the provision—in her case lack of provision—of cured fodder.

These phases have not, of course, been sharply defined, but the main trend of events has been in the direction indicated.

CARRYING-CAPACITY AS AN INDEX OF INTENSIVENESS OF FARMING.

Subject to variations in natural fertility, the carrying-capacity per acre may be taken as a fair indication of intensiveness in farming. In this respect New Zealand commands prominence amongst the newer countries. A recent analysis by Professor Perkins (Jour. of Agric. of S. Aus., May, 1915) reveals the somewhat disconcerting fact that even New Zealand in this respect lags considerably behind such a moderately intensively farmed country as England. The following summary of statistical data bearing upon the relative positions of the two countries may be

of interest to the New Zealand agriculturist. The statistics for England are those for 1913; those for New Zealand are for 1911—the latest available—but the slight difference in respect of years would not influence the comparison to any extent.

	New Zealand.	England and Wales.
Total agricultural and pastoral areas ..	40,163,886 ac.	30,934,648 ac.
Area supporting almost exclusively live-stock	39,410,664 ac.	26,561,266 ac.
Percentage of agricultural and pastoral areas supporting live-stock	98·12 per cent.	85·89 per cent.
Crops specially grown for live-stock ..	1,398,236 ac.	11,959,192 ac.
Percentage of agricultural and pastoral areas of crops specially grown for live-stock ..	3·48 per cent.	35.45 per cent.
Area under forage crops	691,375 ac.	1,778,310 ac.
Percentage of agricultural and pastoral areas under forage crops	1·73 per cent.	5·75 per cent.
Total live-stock carried, expressed in their equivalent in sheep	42,013,573	73,270,222
Live-stock carried on area supporting live-stock, expressed in their equivalent as sheep per acre	1·04	2·76

It may be argued that the positions of the two countries are not wholly comparable. If so, the advantages in favour of increased attention to forage crops would appear to be with New Zealand. Her soils are newer and more fertile, and do not require lavish expenditure for manures. In many cases the aggregate time spent in making and applying farmyard manure alone in England is equal to the whole time of one man in every five. Small paddocks, broken time, and extra cultivation due to unfavourable weather, maintenance of drains and ditches, increased attention to live-stock in winter, less expeditious rates of work, are against the English farmer; so that, while actual labour rates are lower, the total labour-costs of producing meat, mutton, wool, and dairy-produce are in many cases considerably greater than in New Zealand. There seems little reason to doubt that increased attention to forage cropping would result in larger profits to the farmers individually, more regularity in the employment of labour, and greater prosperity to the country as a whole.* To the question "How can agriculture be profitably intensified at the present time?" one may confidently answer, "By increasing the area under temporary pasture and forage crops." The advice is timely for preparation for forage crops for midsummer, autumn, and winter use, and from the point of view of food-supplies to meet probable shortage during and after the war. The farmer may unite patriotic motives with considerations of personal profit in deciding upon this course.

* The fact that England benefits in the statistical comparison of carrying-capacity by extensive importation of stock foods is not considered as materially affecting the necessity for increased forage-cropping in New Zealand.

ROTATION AS AN INDEX OF INTENSITY.

The adoption of a definite rotation marks the transition from methods wholly extensive to methods more in keeping with present-day conditions. Even when a lengthened rotation involving a large proportion of grass or the bringing of a certain proportion of a farm under rotation is decided upon a forward step has been taken. The all-too-common practice in the North Island of allowing good arable farms to remain indefinitely in grass, with a paltry area devoted to turnips and an equally trivial area annually shut up for hay, admits of no substantial defence on economic grounds. *Per contra*, the extremely intensive types based upon the old Wiltshire rotation, and sometimes advocated for certain parts of New Zealand, are equally hard to justify, for reasons that may be made clearer by consideration of an example of a rotation which is too intensive for average New Zealand conditions:—

First year: Forage crop (mangels, oats and tares, rape, maize, &c.).

Second year: Cereal crop for hay or grain; catch-crop—mustard, tares, clover—ploughed under for green manure.

Third year: Forage crop; and peas or tares for grain.

Fourth year: Temporary pasture.

Fifth year: Temporary pasture.

It may be noted that, apart from the catch-crop, a forage crop is provided in the first year and partly in the third year. This, together with the two years' pasture, is ample for the maintenance of humus on the lightest soil. The growing of an additional green-manuring crop in the second year becomes, therefore, rather much a case of "carrying coals to Newcastle." The expense is not warranted except when it becomes necessary to "bring back" a run-down soil. It is seldom that it pays to entirely plough in a green crop. The fact is often lost sight of that when a crop is grazed off approximately 60 per cent. of the total organic matter in the crop is left in the ground as root and other debris and droppings of the stock used to feed it off.

It may be urged that it is an axiom of good farming to maintain the land in a high state of productiveness. We have to remember, however, that farming is not exempt from the economic law of diminishing returns, which states that successive increments on crops are only wrung out of the soil at an increasing cost for each, until finally a point is reached where profits cease and loss follows. The farmer has cognizance of this law when, on viewing tremendous crops on experimental farms, he asserts that he, too, could grow such crops if the Government would foot the bill.

The same idea is expressed by the Roman writer Pliny, "The ancients assert that nothing turns to less account than to give land excessive culture. In what manner, then, are lands to be cultivated to the best advantage? In the cheapest manner, if it is good." High farming, through the storing-up of extraordinary reserves of fertility, evidently had not the unqualified approval of the ancients. But, apart altogether from questions of fertility, the farmer may have valid reasons why his system should not show such a high ratio of crops to grass as that given. One must draw a distinction between profit per acre and profit per farm.

PROFIT PER ACRE AND PROFIT PER FARM.

The New Zealand farmer is not usually limited for land. His operations are more generally limited by working capital—required for equipment, stock, labour, &c. A given working capital invested in a 200-acre farm worked intensively on short rotation may return a net profit of £200, or 20s. per acre. A very small increase of working capital spread over 400 acres on a more extensive system may, after due deduction of interest on increased fixed capital, return no more than 15s. per acre. The farm income has, however, been raised to £300. It is admitted that the higher the values of land and produce the stronger becomes the case for intensive farming. At the present time the conditions throughout the cultivated districts in the Dominion would not appear to call for a closer rotation than is represented by a ratio of crops to grass of 1 to 2, and this is, of course, very much closer than is commonly practised in most districts. When desired the rotation may be narrowed, at slight expense, by the introduction of a catch-crop for grazing, as in the following example of a well-designed rotation for mixed farming:—

First year: Forage crop (swedes, mangels, rape, maize, &c.).

Second year: Oats for hay and grain, leguminous catch-crop sown on stubble, or clover sown with oats.

Third to seventh year: Pasture.

INTENSIVE FARMING *versus* TOP-DRESSING.

The average farmer is ready to embrace any scheme which will save him the trouble of renewing pasture by putting his paddocks through a course of cropping. Top-dressing with lime and phosphatic manures, in some cases with the addition of salt or kainit, has been much in vogue for this purpose of recent years, even on land which has been under the plough. Where white clover is present in the pasture in a suppressed condition extra-

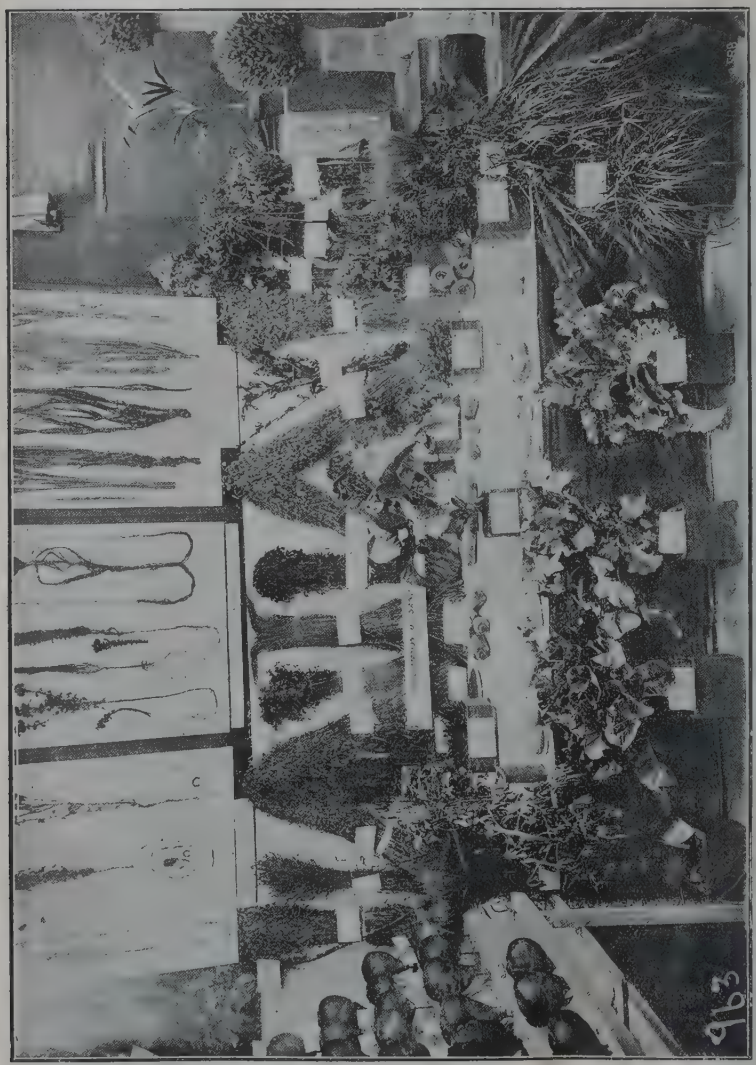
ordinary results are frequently secured in this way for a time. Top-dressing cannot, however, permanently replace cultivation. At best it is an expedient for prolonging the life of a pasture in a profitable state for a year or two. It cannot replace unproductive inferior grasses with strong-growing nutritious ones, nor can it produce a good sward out of a thin, patchy, weed-infested pasture. A less-tried method, but one which has much to recommend it, is the wintering of sheep on poor pasture, with the aid of roots and grass and clover hay carted on at intervals. A marked change in favourable seasons is brought about by the replacement effected by the growth from the grass and clover seeds, stimulated by the sheep-droppings and artificial top-dressing, in early spring. Even Chewings fescue and similar tenacious bottom grasses will give way to this treatment.

GRADUAL PROGRESS AND CAREFUL RECORD OF RESULTS NECESSARY.

If it is thought that the subject has not been treated sufficiently in detail, it may be pointed out that, with the most careful consideration of all available data, no definite or decisive pronouncement can be made on the important matters at issue. The most thorough investigation of the economic factors at play in New Zealand farming is necessary. Such an investigation is proposed, but is hedged about with unusual difficulties, and time must elapse before sufficient data accumulate to enable authoritative conclusions to be reached. Meantime, much may be done by progressive farmers by *gradual* change in their methods, and careful study of the full effects of such change by means of adequate cost accounts. How these accounts should be kept so as to yield up the desired information may be the subject of a future article.

Among the varieties of oats and barley introduced into New Zealand by the Department are White Ligowo oats and Hannchen barley. The White Ligowo oat has established itself in many parts of the Wairarapa, and also in some portions of the Taranaki District, where it has been grown for winter feed with excellent results. It is liable to rust, although perhaps not so readily as many other varieties. It is a Swedish oat selected at the Svalof Institution. Hannchen barley, a variety from the same source, has also been established in the Wairarapa district, where it has been grown for both seed and green feed. A favourable report on its value for malting purposes has been received. In a season trial made at Marton it carried more sheep for a longer period than did either Cape, Black Russian, or White Russian. It has, however, been beaten by Swanneck barley, which is a variety also imported by the Department.—*G. de S. Baylis.*

NEW VARIETIES OF WHEAT INTRODUCED BY THE DEPARTMENT, GROWN IN CANTERBURY.—WINTER SHOW EXHIBIT, 1915.



SAND RECLAMATION EXHIBIT.- DEPARTMENTAL WINTER SHOW DISPLAY, 1915.

THE BOX METHOD OF TESTING MANURIAL REQUIREMENTS OF SOILS.

G. DE S. BAYLIS.

IN the use of fertilizers the average farmer is often much handicapped. To the farmer who has not had the opportunity of scientific training a chemical analysis of his soil is somewhat like Greek to a man who has never learnt it.

Much thought, much work, time, and hard cash could be saved and better results obtained from the use of fertilizers were there in use some facile method, understandable by the man of ordinary intelligence, of testing the value of various fertilizers to the various soils. The farmer could then make the plant he was about to grow, as it were, analyse the soil for him, while the experimenter might, after preliminary trials so made, considerably reduce the number of experiments that it would be worth his while to test in the field plots.

The "box" method of testing the manurial requirements of soils places the practice of this subject within the power of all those interested in it, be they farmers, manure-merchants, school-teachers, experimenters, or students, and, provided that the test is made under normal conditions and that the conditions in the field as to drainage and those other essentials of fertility other than fertilizers are satisfactory, the box tests will be found to be a facile method of discovering the manurial requirements of soils.

Every intelligent farmer knows that the fertility of a soil cannot be assured by the application of fertilizers alone. Adequate drainage, lime, light, heat, moisture, a proper mechanical condition, the presence of certain forms of bacterial life as well as the elementary plant-foods are necessary before healthy plants can be grown and good crops harvested.

THE METHOD DESCRIBED.

After experimenting with boxes of various sizes I have come to the conclusion that where a fair amount of soil can be readily

obtained the most convenient size is a box 18 in. long, 12 in. broad, and 6 in. deep, or deeper if desired.

Drainage.—Two lines of three holes each are drilled with a half-inch auger in the bottom of the boxes. Small shingle is procured, washed clean, and a given weight put in each box—say, 1 in. to 1½ in. in depth.

Soil.—The soil to be tested is taken from representative portions of the paddock and thoroughly mixed. Some 40 lb. to 50 lb. will be required for each box of the above dimensions. If wet,

THE BOX METHOD OF SOIL-TESTING.

Soil, Palmerston North Borough Reserve. *Top Row* (from left to right).—Box (1), 3 cwt. superphosphate, 9½ tons green manure turned under; (2) 3 cwt. superphosphate; (3) no manure; (4) 9½ tons green manure. *Bottom Row.*—Box (1), 1 cwt. basic slag, 1 cwt. bonemeal, 1 cwt. dried blood, ½ cwt. sulphate of potash, 9½ tons green manure; (2) 1 cwt. slag, 1 cwt. bonemeal, 1 cwt. dried blood, ½ cwt. sulphate of potash; (3) 1½ cwt. slag, 1½ cwt. superphosphate; (4) 1½ cwt. slag, 1½ cwt. superphosphate, and 9½ tons green manure. (All quantities per acre.)

it should be partially dried by exposure to the air. It may be then run through a sieve of a mesh convenient to the nature of the soil. The boxes are then filled with soil and shaken down to ensure firmness, an equal weight being placed in each box.

Sowing.—If the crop is to be sown in drills the box arrangement is as shown in diagram 1 on opposite page. The first drill

is 3 in. from the side A of box, the second drill 9 in. from A, the third drill 15 in. from A, or 3 in. from side B of box.

If the crop is to be broadcasted do not fill the box quite up; reserve just enough soil to cover the seed. Mark off on ledge of box eighteen separate inches from A to B and from D to C, and twelve separate inches from A to D and B to C. With a sheet of glass 17 in. by 3 in. mark these eleven lines on the soil by pressing glass on it in direction A to B, and likewise with a piece of glass 11 in. by 3 in. mark seventeen lines on the soil in direction A to D (see diagram 2). This glass is also convenient for opening up the drills when the seed is being sown in drills

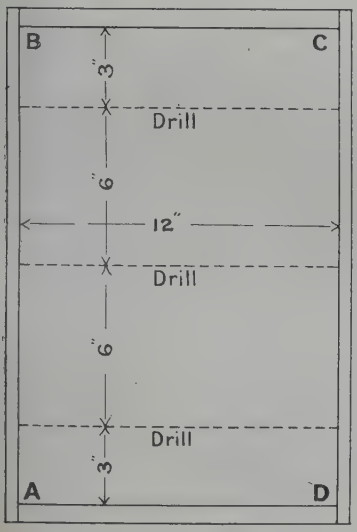


DIAGRAM 1.

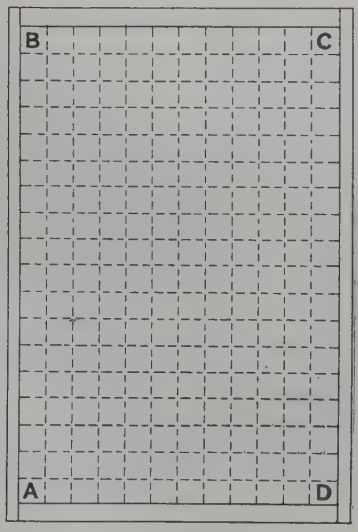


DIAGRAM 2.

instead of broadcast. The surface of the soil has now been ruled into inch squares, upon each of which, or upon as many of which as required, a seed may be placed; thus the seed becomes evenly distributed without the trouble of counting same. It is needless to say that seed of the same variety, quality, and age must be used in every box

When broadcasting, the fertilizer is distributed evenly over the surface of the soil and mixed in. This, of course, is done before the squares are ruled for sowing.

Quantities to use.—When a box 18 in. by 12 in. is marked off into three drills as before described the box contains the equiva-

lent of 3 ft., or 1 yard of running drill, 6 in. between drills. 26·997 grains, or 0·35 grains less than one-sixteenth of an ounce (avoirdupois), of fertilizer sown to 1 yard of drill is equivalent to sowing 1 cwt. per acre when drills are 6 in. apart. If fertilizer is to be applied at the rate of 1 cwt. per acre or more, then for every hundredweight weigh out 26·997 (approximately 27) grains, and for every fraction of a hundredweight weigh out its equivalent. (See Table 2.)

After the fertilizers necessary for the manurial mixture to be utilized have been weighed out carefully, an equal weight of dry fine sifted soil taken from the soil under test should be mixed

THE BOX METHOD OF SOIL-TESTING.

Soil, Marton Junction Experiment Plots. *Top Row* (from left to right).—Box (1), 2 tons limestone, 1 cwt. slag, 1 cwt. bonemeal, 1 cwt. dried blood, 9½ tons green manure; (2) same as No. 1 without green manure; (3) no manure; (4) 9½ tons green manure. *Bottom Row*.—Box (1), 2 tons limestone, 1½ cwt. superphosphate, 1½ cwt. slag; (2) same as No. 1 with green manure; (3) 2 tons limestone. (All quantities per acre.)

thoroughly with them. If the fertilizer is to be drilled, this mixture is then weighed out into three equal portions, and one portion drilled into each of the three drills which have been already prepared. The fertilizer so drilled is then covered with a small quantity of soil and lightly pressed down, the seed being finally sown in the drills and covered with the necessary amount of soil.

Example.—Suppose the formula to be utilized is as follows: 2 cwt. superphosphate, 1 cwt. bonemeal, ¼ cwt. dried blood. Weigh out as follows: superphosphate 53·9 grains, bonemeal 26·9 grains, dried blood 6·7 grains (see table showing quantities of manure to be used per running yard of drill): total weight, 87·5 grains. Mix this amount very thoroughly with 87·5 grains of dry very fine sifted soil taken from the same box, divide it into three equal portions of 29·1 grains, and apply one of these portions to each drill as before described. If the fertilizer is to be broadcasted the 175 grains of soil-and-fertilizer mixture are evenly distributed over the surface and lightly dug in. The inch squares are then ruled on the surface of the soil by pressing the glass upon it, and the seed is sown and lightly covered with the earth reserved for that purpose.

Weights and Measures.—If it is possible to obtain a chemical balance, then of course any quantity in reason, however minute, can be weighed out. Such delicate apparatus is, however, not in the possession of every one. Small balances quite sufficiently sensitive can be purchased from about 4s. upwards at any photographic store, weighing in grains, scruples, and drams. A small lever dispensing-scale is made by W. and T. Avery, weighing from ½ grain up to 8 drams, or about 480 grains, the price of which is about £1 10s. in this country, obtainable from wholesale druggists.

In order to facilitate operations I have compiled a table (No. 2) which is appended. This table acts as a ready reckoner, and the weight required, representing any number of pounds from 1 cwt. downwards, is readily seen at a glance.

On a chemical-balance any quantity, however minute, can be weighed. On an apothecary's balance or a photographic balance the lowest weight usually supplied is ½ grain, which for the purpose of these tests is practically equal to 2 lb. (See Table 2.) It follows that, when using weights weighing down to ½ grain, one can weigh any weight required down to as low as 2 lb. per acre. By obtaining smaller weights—¼ grain, which is just over 1 lb., and ⅛ grain, just a trifle over ½ lb.—the minimum quantities are brought still lower. When using the decimal ready reckoner, and working with apothecaries' weight with a minimum of ½ grain, take the half-grain which the decimal approaches nearest to. For instance, 95 lb. is represented by 22·899 grains, and therefore 23 grains may be weighed out; 30 lb. is represented by 7·231 grains, and 7 grains are weighed out, and so on.

While a scale capable of weighing in grains is certainly desirable, a sensitive pan balance weighing in ounces and fractions

thereof can be utilized as a means of making a rough test. Extra weights of $\frac{1}{16}$ oz. avoirdupois are necessary to enable the equivalent of 1 cwt. to be weighed. These have been made for me by Mr. W. H. Worrall, Victoria Arcade, Auckland.

Making Stock Fertilizer Mixtures. — If several soils are to be tested with the same mixtures, much delicate weighing may be avoided by taking 1 oz., 12 oz., or 16 oz., or any convenient number, as representing 1 cwt. in the manure formula, and weighing out fertilizers in like proportion. Thus, say formula was 1 cwt. superphosphate, $\frac{1}{4}$ cwt. sulphate of potash: weigh out 12 oz. superphosphate and 3 oz. sulphate of potash, mix well together, and

THE BOX METHOD OF SOIL-TESTING.

Soil, Taumarunui pumice loam. *Top Row* (from left to right).—Box (1), 10 tons green manure; (2) no manure; (3) 10 cwt. superphosphate; (4) same as No. 3 with green manure. *Bottom Row.*—Box (1), 3 cwt. superphosphate, 3 cwt. slag, 3 cwt. blood, 1 cwt. bonemeal; (2) same as No. 1 with green manure. (All quantities per acre.)

then for every 1 cwt. of this mixture to be applied weigh out 26·997 grains, or roughly $\frac{1}{16}$ oz., and mix this with its equivalent of fine dry sifted soil before using.

Recording Results.—Having sown the seed either in drills or broadcast, after the plants are well up the boxes should be examined and the plants thinned, so that the same number of plants are contained in each drill and in each box. When the seed is drilled the plants are easily counted. When broadcasted the

number of plants is easily ascertained by examining the squares made by the intersection of the lines ruled on the edges of the boxes, and noting the number of those in which plants are absent. Periodical examinations are made, and results may conveniently be tabulated in the following manner for comparative purposes:—

BOX-TEST RECORD-SHEET.

Soil: Medium clay, Palmerston North. Crop: Garton oats.
Date sown: 1st September, 1915.

Box No.	Fertilizer.	Date.	Average Height.	Colour (100 Max.).	Vigour (100 Max.).	Remarks.
1	3 cwt. super. per acre	18 Sept.	1½ in.	15	15	Sickly.
2	1½ cwt. slag, 1½ cwt. super. per acre	,,	2 in.	50	40	Healthy.
3	B mixture, 3 cwt. per per acre	,,	2¼ in.	50	75	Very strong.

Plants can be grown and harvested, if desired, and yields recorded, but in a great many instances a trial of a few weeks' duration is often sufficient to prove by ocular demonstration the fertilizer which is producing the best growth and the healthiest plants.

To the scientific farmer an indication of the soil's weak points when growing any one crop enables a very shrewd opinion to be arrived at as to what it is likely to require for other crops. When, however, testing the soil for a special crop plants of the latter can be grown, or plants belonging to the same class or family should the special crop be inconvenient for box purposes.

Treatment during Trials.—As far as care of the boxes after sowing is concerned no special treatment is necessary; but as I do not wish, after the trouble of preparing the trials, to lose all by the ravages of slugs or drought, I keep my boxes on a raised platform the legs of which stand in a plate of salt. The whole stand is covered with a movable framework of bird-proof netting, standing 6 ft. high, and if on account of very dry weather watering is necessary a measured quantity is given to each box.

Smaller Boxes.—Although I do not advise working with very small areas of soil, still, where it is impossible to obtain soil in full quantities and it is absolutely necessary to be contented with less, the boxes may be reduced to two-thirds the size specified—viz., 12 in. by 12 in. by 6 in., instead of 18 in. by 12 in. by 6 in. The equivalent to 1 cwt. per acre will then be 17·99 instead of

26·997 grains. In this case also the box will contain two drills 12 in. long, arranged thus: First drill 3 in. from side of box, second drill 9 in. from same side of box, or 3 in. from opposite side of box.

APPLICATION OF THE METHOD.

Carefully carried out by intelligent observers the box method of testing the manurial requirements of soils, and of the various crops grown upon them, should prove of considerable value. While it supplies the farmer with a means of determining the mixture likely to give him the best results, and thus ensures him against wasting money on unsuitable fertilizers, it also offers to school-teachers an excellent method of demonstrating the science of manuring. If capable school-teachers with some knowledge of the subject were to adopt this means of instruction, they could not only readily demonstrate to the students in a practical manner, at a very small cost in time and money the respective values of different fertilizers to the soil, but eventually, through the number of soils they would be able to handle in the course of a few years' instruction work, the schools might become a sort of bureau of information as regards the different soils in their various neighbourhoods. In a country so varied in its soil requirements as New Zealand this would largely assist the farmers in their efforts to increase the production of the land, and indirectly the revenue of the Dominion.

TABLE I, SHOWING NUMBER OF DRAMS AND GRAINS IN 1 LB. AVOIRDUPOIS AND FRACTIONS THEREOF.

1 dram of 3 scruples (apoth.) equals 60 grains.
16 ounces (avoir.) equals 7,000 grains.
16 ,, ,, ,, 116·6̇ drams (apoth.).

16	ounces	equals	116·6̇	drams	(apoth.) equals	7,000	grains.
1	ounce	,,	7·29	,,	,,	437·50	,,
¾	,,	,,	5·46	,,	,,	328·125	,,
½	,,	,,	3·64	,,	,,	218·75	,,
¼	,,	,,	1,82	,,	,,	109·375	,,
⅛	,,	,,	0·91	,,	,,	54·687	,,
1/16	,,	,,	0·45	,,	,,	27·34	,,

1·822 drams equals 109·37 grains.
1 ,, ,, 60 ,,

Note.—The grain is equal in both apothecaries' and avoirdupois weights.

TABLE 2, SHOWING QUANTITY OF MANURE TO BE USED PER RUNNING YARD OF DRILL WHEN DRILLS ARE 6 IN. APART AND MANURE IS APPLIED AT THE RATE OF 1 CWT. PER ACRE.

If 112 lb. applied to 1 acre in drills 6 in. apart is equivalent to 26·997 grains applied to 1 yard of drill, then—

1 lb.	per acre	is	equivalent to	0·241	grains per running yard of drill.
2 lb.	,,	,,		0·482	,, ,,
3 lb.	,,	,,		0·723	,, ,,
4 lb.	,,	,,		0·964	,, ,,
5 lb.	,,	,,		1·205	,, ,,
6 lb.	,,	,,		1·446	,, ,,
7 lb.	,,	,,		1·687	,, ,,
8 lb.	,,	,,		1·928	,, ,,
9 lb.	,,	,,		2·169	,, ,,
10 lb.	,,	,,		2·410	,, ,,
20 lb.	,,	,,		4·820	,, ,,
25 lb.	,,	,,		6·025	,, ,,
30 lb.	,,	,,		7·231	,, ,,
35 lb.	,,	,,		8·436	,, ,,
40 lb.	,,	,,		9·461	,, ,,
45 lb.	,,	,,		10·846	,, ,,
50 lb.	,,	,,		12·052	,, ,,
55 lb.	,,	,,		13·257	,, ,,
60 lb.	,,	,,		14·462	,, ,,
65 lb.	,,	,,		15·667	,, ,,
70 lb.	,,	,,		16·873	,, ,,
75 lb.	,,	,,		18·078	,, ,,
80 lb.	,,	,,		19·283	,, ,,
85 lb.	,,	,,		20·488	,, ,,
90 lb.	,,	,,		21·694	,, ,,
95 lb.	,,	,,		22·899	,, ,,
100 lb.	,,	,,		24·104	,, ,,
112 lb.	,,	,,		26·997	,, ,,
56 lb.	,,	,,		13·498	,, ,,
28 lb.	,,	,,		6·749	,, ,,
14 lb.	,,	,,		3·374	,, ,,
7 lb.	,,	,,		1·687	,, ,,
3½ lb.	,,	,,		0·843	,, ,,
1¾ lb.	,,	,,		0·421	,, ,,

A WELL-CULTIVATED ORCHARD.

FOREST-TREES FOR SETTLERS.

A CANTERBURY EXPERIENCE.

TASMAN SMITH.

TIMBER is the one great natural resource that can be renewed. Afforestation should therefore be steadily encouraged by Governments, local governing bodies, and rural societies, and tree-planting practised by landowners, large or small. The timber-supply is, indeed, a matter of national concern. In New Zealand it must be borne in mind that our native forests are rapidly diminishing. Moreover, countries from which we import certain timbers to-day will in the not-distant future be importers themselves and not exporters. Owing to the increased demand for all classes of timber, every country is realizing the importance of afforestation and the conservation of timber-trees. There are, of course, many other reasons why we should plant trees, such as the importance of conserving moisture, the beautifying of our lands, the protection of buildings, gardens, and orchards, and the shelter of live-stock from the heat of summer and the cold winds and frosty nights of winter.

Necessity has compelled Canterbury to undertake tree-planting on a larger scale than any other province of the Dominion. The magnitude of our plantings in this district is noticed and commented upon by visitors from all parts. As many people refrain from tree-planting for want of knowledge of the subject, the writer trusts that the publication of some of his personal experience may encourage some farmers to commence operations, and others to extend their present plantings this season.

First let me impress the fact that fencing is a necessary preliminary to planting, and one that forms the initial and greatest cost. A good substantial fence is the cheapest in the long-run. Success in tree-planting depends greatly on keeping all live-stock from the trees till the latter are 8 ft. or 10 ft. high. In the case of a shelter-belt, never let live-stock in, for they soon destroy lower limbs and let the wind through. A first-rate fence can be erected at a cost of £3 per acre; the smaller the enclosure the greater the cost in proportion, and *vice versa*. Do not erect a makeshift fence with the idea of

renewing it later on. In nine cases out of ten labour and trees will be lost through stock getting in when you are busy with other things.

I will now make some comment on various introduced trees in the order of their value to settlers in this country, according to my experience. It is understood, of course, that most of our native trees are, unfortunately, unsuitable for utility planting owing to their very slow growth.

Pinus radiata or *insignis* (Monterey pine) is a native of California and adjacent islands, and is a valuable tree in many respects. It will grow and thrive in most soils and aspects up to an altitude of 1,200 ft. to 1,500 ft. For making quick shelter it has no rival, and no other tree we have can equal it for growth, established individual trees on a free subsoil making 6 ft. of growth in a season. Large numbers of *Pinus radiata* planted in the Mackenzie County in the "eighties" are now 100 ft. high. When standing alone *Pinus radiata* is a most noble tree. I have seen single thirty-year-old trees 80 ft. to 90 ft. high, with a trunk 4 ft. in diameter, and boughs extending 30 ft. from the trunk. The adaptability of this tree to all soils and its rapid growth destines it to play a great, if not the greatest, part in our future timber-production. Large quantities of its timber are being used to-day for building, box-wood, and fuel. During the past few years *Pinus radiata* has taken the place of matai and rimu for all purposes except flooring in the construction of many residences throughout Canterbury. In 1913 two million feet of this timber was used in Christchurch for boxmaking alone. The Mackenzie County Council recently milled 70,000 ft. of timber from three-quarters of an acre of thirty-year-old *radiata* plantations, and sold it at a price that returned £1 per thousand over cost of milling. On the present occasion, however, I will not go into the profit-and-loss side of plantations.

Cupressus macrocarpa is also a native of California, but is only found there in very small areas, and is said to be dying out on account of the climate changing. *Macrocarpa* will never die out in foreign lands, for the more we learn of its good qualities the more it will be cultivated. It will grow and thrive in most warm, sweet lands up to an elevation of about 900 ft. above sea-level, above which its growth is small, and it is subject to destruction by severe frosts. This tree makes splendid garden-fences, as it stands cutting and trimming well. It also makes very good shelter-belts, growing at a good rate—from 3 ft. to 4 ft. a year—till twenty years old, when it appears to throw most

of its energies into the limbs. For quick production of fencing-material, stakes, posts of all kinds, strainers, stays, &c., we have no tree to equal it. I have removed *macrocarpa* posts 9 in. in diameter after fourteen years in the ground, and found the heart-wood, both of trunks and limbs, perfectly sound and as hard as black-pine or any of our native beeches (birch).

The best method of planting *Cupressus macrocarpa* is first to cultivate the land, if possible, in order to preserve the moisture. Plant in early autumn, so that the soil may become well set about the roots, before the advent of the spring winds which so often loosen the young trees, admitting air and heat to the rootlets—death following if the season is moderately dry. Plant in blocks 4 ft. or 5 ft. apart, which will cause them to run up as long straight poles with small branches. After ten years every second tree may be cut out for fencing-stakes, stays, rails, &c., when the remainder will thicken into heavy posts for permanent fencing. The waste timber makes first-class firewood. I might mention that I have split and used 6 in. by 3 in. *macrocarpa* rails in a stockyard for sixteen years, and they show no sign of decay.

Abies Douglasii, or Douglas fir, sometimes called Oregon pine, is one of the best timber-trees introduced into New Zealand. It is a native of western North America, and its distribution ranges over a larger area than that of any other fir-tree. Its northern limit is placed at about latitude 55°, near Lake Tacla, in British Columbia; from this point it follows the Rocky Mountain system southwards through the whole length of the United States to western Texas, and then into Mexico for several hundred miles. Its vertical range varies with the climate; it has been found growing at an altitude of 11,000 ft. above sea-level, which indicates that it should grow anywhere in New Zealand. Its wood is one of the best, and is used for all kinds of construction, such as house-building, spires, masts of ships, &c. This tree was largely planted in the Mackenzie County in the "eighties," and has proved itself worthy of much greater attention by all who contemplate planting for ornamental, shelter, or commercial purposes. It will grow and thrive in any aspect and in any soil except sour or waterlogged ground. As an ornament, and certainly from a timber point of view, no other tree can equal it. Trees planted in 1886, thirty years ago, have attained noble dimensions for their age, their height being from 60 ft. to 70 ft. and circumference from 6 ft. to 7 ft. I cut a number for timber a few years ago, obtaining 8 in. by 8 in. 20-ft.-plank lengths of

good quality timber, rather darker in colour than the imported Oregon timber. Six years ago I planted 4,000 two-year-old *Douglasii* on a steep southerly facing covered with snow-tussock—with remarkable success. Deaths have been less than 1 per cent., and average yearly growth 2 ft. 6 in., odd trees making as much as 5 ft. The greatest drawback of *Douglasii* for afforestation is the brittleness of the young leaders in strong winds. When broken they often throw double leaders, which are detrimental to timber-production. I would recommend planting a belt of *insignis* on the windward side of *Douglasii*.

Larix (larch) is a deciduous tree of no shelter value, of which there are fifteen or twenty species growing in many parts of the Northern Hemisphere. The species most common in New Zealand is the *Larix europaea*. It is an alpine tree, and is found growing wild at an altitude of 6,000 ft. to 7,000 ft. on the Alps and Carpathian Mountains. It was introduced into Great Britain about the seventeenth century, and largely cultivated in the eighteenth century. Larch timber is of great value, chiefly on account of its durability and strength, also quick production. It is used in Great Britain for rural purposes, mining operations, railway-ties, telegraph-posts, and scaffold-poles—in fact, wherever durability under pressure of the weather is required. Farmers should plant large numbers of these trees 4 ft. apart in blocks, but only on damp, dark facings, where they thrive and grow rapidly. In eight or ten years every second tree will cut three or four stakes for turnip-fences. Larch should never be planted on dry, sunny, or wind-swept lands without a shelter-belt of *insignis*. I planted ten thousand larch-trees 4 ft. apart six years ago on a cold southerly facing, and hundreds could be cut for stakes at the present time. I have ten-year-old larch strainers and gate-posts cut from twenty-year-old trees which show no signs of decay.

Pinus ponderosa is another native of North America found in much the same localities as *Abies Douglasii*. It is one of the tallest of pines, odd trees having attained the large dimensions of 250 ft., with a trunk 12 ft. in diameter. The wood of *Pinus ponderosa* is largely used throughout the United States for construction purposes generally. More of this tree should be planted, as it stands drought and wind better than any other of our introduced trees and produces a good class of timber. It is not a very good shelter-tree.

Pinus strobus (Weymouth pine) is one of the most important timber-trees of North America, where it attains a height of 125 ft.

to 150 ft. Every year large quantities of this timber are felled and sent to Europe under the name of white-pine. It is so highly esteemed in the States that they are cultivating it on a large scale. It is light, soft, straight-grained, not strong, and grows best on warm sunny land, where it makes good growth, standing wind well.

Pinus Laricio, often called Corsican pine, comes from central and southern Europe and western Asia, where it grows to an altitude of 4,000 ft. to 5,000 ft. This tree is recommended by the best forestry authorities for profitable planting — quality, quantity, general utility, and early maturity. It matures at seventy or eighty years, but is fit for milling at thirty to forty years. It will grow in any class of soil or situation, like the *insignis*, and is a fair shelter-tree. Its timber is tough, very durable, and long-grained, though a little coarse in texture.

All these varieties of trees are best planted out at two years old. On no account should varieties be mixed when planting, as one kind soon outgrows other varieties, ultimately killing them.

PINUS RADIATA IN CANTERBURY.

PHOSPHATES AND LIMESTONE.

B. C. ASTON, F.I.C.

RESEARCH in New Zealand for the improvement of crops and pastures by chemical means naturally centres round the supply of phosphates and limestone, and the lines upon which investigation should, I think, proceed are as follows:—

Search in New Zealand for further phosphate-fields.

Soil surveys and properly conducted field experiments to ascertain the particular form of phosphate required for particular areas.

Obtaining cheap external supplies of phosphate.

Utilizing our present abundant limestone-deposits to a greater extent.

The great need of New Zealand for phosphates must be realized by all when the imports for the year are considered. Of purely phosphatic fertilizers there were imported in the year ending 31st March, 1915, 117,849 tons, of a declared value of £421,181, an increase, in spite of the eight months of war, of 14,796 tons, and £61,499 over the same period of last year. The following detailed figures are interesting:—

	Quantity.		Value.	
	1915.	1914.	1915.	1914.
	Tons.	Tons.	£	£
Bone char	686	665	2,270	2,219
Bonedust	7,966	6,578	52,235	41,870
Blood and bone	798	1,245	5,195	8,212
Basic slag	29,385	30,350	97,716	97,589
Superphosphate	54,190	41,582	196,009	151,780
Rock phosphate	23,983	22,093	64,881	56,169
Other phosphate	841	540	2,875	1,843
Totals	117,849	103,053	421,181	359,682

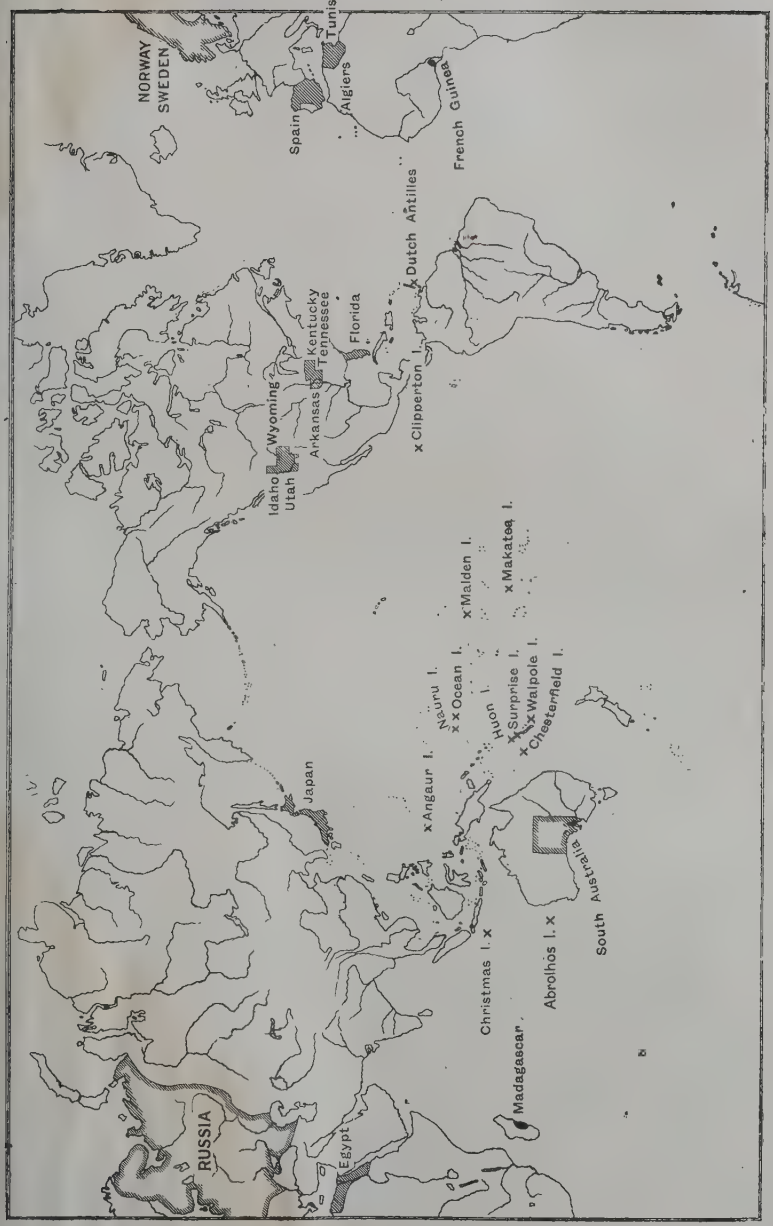
When the importers' profit and charges are added to this, and the amount of locally produced bone and the product of the Otago phosphate-field are also added, it is seen that the New Zealand farmers are yearly spending on phosphates considerably over half a million sterling.

Desultory search in New Zealand by enthusiastic but amateur seekers has resulted in various isolated specimens of phosphate rock, some very rich, being discovered. Pamphlets and specimens have been distributed and all assistance given to prospectors, but no field or deposit has yet been discovered similar to that at Clarendon, in Otago. A systematic search by qualified geologists of all the districts likely to yield phosphate has, however, yet to be made.

A good many analyses of soils have been made, and some flying surveys have been made of certain districts, but the research work in the laboratory has not been correlated with field trials, and the exact and comprehensive information which these experiments might give is lacking. Steps are being taken to provide the data required, but until this exact knowledge is obtained it would be futile to advise the adoption of any particular form of treatment to supply phosphates when different districts may require different methods involving variation in the methods of manufacture or application. Thus one district with acid soils finds raw ground phosphate efficaceous, but a basic phosphate might be better. A soil rich in carbonate of lime would probably be best suited with superphosphate, and a stiff clay soil deficient in lime and phosphate, in a wet climate, would respond to slag. Rich dry soils well supplied with phosphate require little additional phosphate, and mica-schist soils extremely rich in phosphate and potash probably need nothing but quicklime. With North Island soils, always very low in phosphoric acid, it pays to apply phosphate heavily.

During the last year I have made special inquiry in America, Canada, and England regarding the cost of phosphate in other countries, and have put the result of my inquiries before the Department. The war is, however, an interfering factor, and definiteness of statement as to prices cannot be expected. Much of the information I have obtained is confidential. I shall, however, be pleased to advise to the best of my ability upon this subject.

In the Pacific, within a few days' steam of New Zealand, are millions of tons of high-grade phosphate of lime (80–88 per cent.) in British and French territory. At Safaga Bay, in Egypt, near the lower end of the Red Sea, are also deposits of phosphate of lower grade than those of the Pacific, but, after treatment, it is claimed that they are of greater availability. Failing deposits in New Zealand sufficient to cope with the demand, the Pacific and the Red Sea deposits would seem to be the natural source of supply for the Dominion, but the possibility of getting Florida



MAP SHOWING THE WORLD'S PRINCIPAL SOURCES OF MINERAL-PHOSPHATE SUPPLY.

All names and shaded parts indicate territories with phosphate deposits.

phosphate must not be overlooked. Madagascar has been exporting quite a lot of phosphate to New Zealand, and Straits Settlements appears in our list of imports as another source. New markets are thus competing for the New Zealand trade as fresh fields are discovered and exploited. The Red Sea deposits would seem to have great advantages over those of the islands in having cheap oil fuel handy, an excellent harbour, and cheap labour, but the product from the islands is purer by some 20 per cent.

Why should not New Zealand farmers obtain a controlling interest in one of these fields? Only in 1911 the Public Works and Mines Department in Algeria advertised the sale of phosphate-deposit leases by tender, on forty years' lease from 1912, the upset rental being 3 francs a ton for the first 100,000 tons, 2 francs on the following 200,000 tons, and 1 franc for 300,000 tons and upwards (a franc is equivalent to 10d.). I merely mention this to show that phosphate-deposits are on the market, and as evidencing the possibility of securing one.

The establishment of a farmers' co-operative fertilizer company was advocated by Mr. J. G. Wilson in a paper read before the National Dairy Association on the 18th June, 1914; also in his presidential address at the annual conference of the Farmers' Union this year. Such a company, by importing cargoes instead of consignments, might do much to cheapen phosphate to farmers.

As I have before pointed out, the use of lime in some form is closely bound up with the economical use of phosphates, and land with a large proportion of lime in the soil is likely to produce good results without the expenditure of so much phosphate. A cheaper lime-supply is therefore desired, and this is at present the most hopeful aspect of the subject.

If farmers would only get the lime in bulk (the bags at present increase the cost by amounts up to 8s. per ton), ground to the fineness advocated by an American authority — viz., that all material should pass through a sieve of six meshes to the linear inch, and contain all the powder produced in grinding it to that fineness — the ground limestone could probably be sold at from 7s. 6d. to 10s. per ton f.o.r. At present, by insisting on the fine grinding of a cheap material like limestone, which becomes more soluble in the soil as time goes on instead of less soluble as do the phosphates, the farmer is proceeding in an uneconomical manner. In America the limestone is heaped up from the trucks on to a four-horse lorry, one man driving, another shovelling the limestone into a V-shaped trough at the tail of the lorry. By this means it is sufficiently well distributed over

the land, and the great cost of bagging and excessively fine grinding is avoided.

Another method of cheapening limestone is by utilizing any soft naturally occurring deposits which need no grinding, and may be dug out and applied to the land without any treatment whatever. This is a principle which I have advocated before, and which is now proving successful.

NOTE.—It may be pointed out that the concession of free railage of lime or limestone for distances up to a hundred miles applies only to lime intended for application to the land for the purpose of improving its fertility. Limestone so carried cannot legitimately be employed in mending roads or paths. The ordinary freight must be paid on limestone for metalling.

WEEDS AND THEIR IDENTIFICATION.

E. H. ATKINSON.

THE present article is the first of a series which it is intended to write on some of the commonest and most important of the weeds of New Zealand. As far as possible the plants described in this series will be arranged in groups, the individual members of each group being dealt with consecutively. The object to this grouping is to bring together for comparison those weeds which so closely resemble one another in general appearance that there is likelihood of their being confused. In order to render each weed recognizable in as many of its stages as possible, illustrations and short descriptions of the seeds and seedlings will be given, as well as the general description of the mature plant.

The following weeds comprise the first group:—

(1.) Catsear (*Hypochaeris radicata*).
(2.) Dandelion (*Taraxacum officinale*).
(3.) Capeweed (*Cryptostemma calendulacea*).
(4.) Hawkweed (*Crepis capillaris*).
(5.) Hawkbit (*Leontodon hispidus*).

CATSEAR (HYPOCHAERIS RADICATA).

General Description.—Catsear is a perennial herb with a long tapering rootstock (tap-root), from which arises a rosette of leaves usually flattened against the ground. In old-flowering specimens, however, there are often two or more rosettes, the leaves of which twist about in many directions, destroying the symmetrical appearance of the plant. It is not possible to give

PLANT OF CATSEAR, SHOWING FLOWERS AND SEED-HEADS; ⅓ NATURAL SIZE.

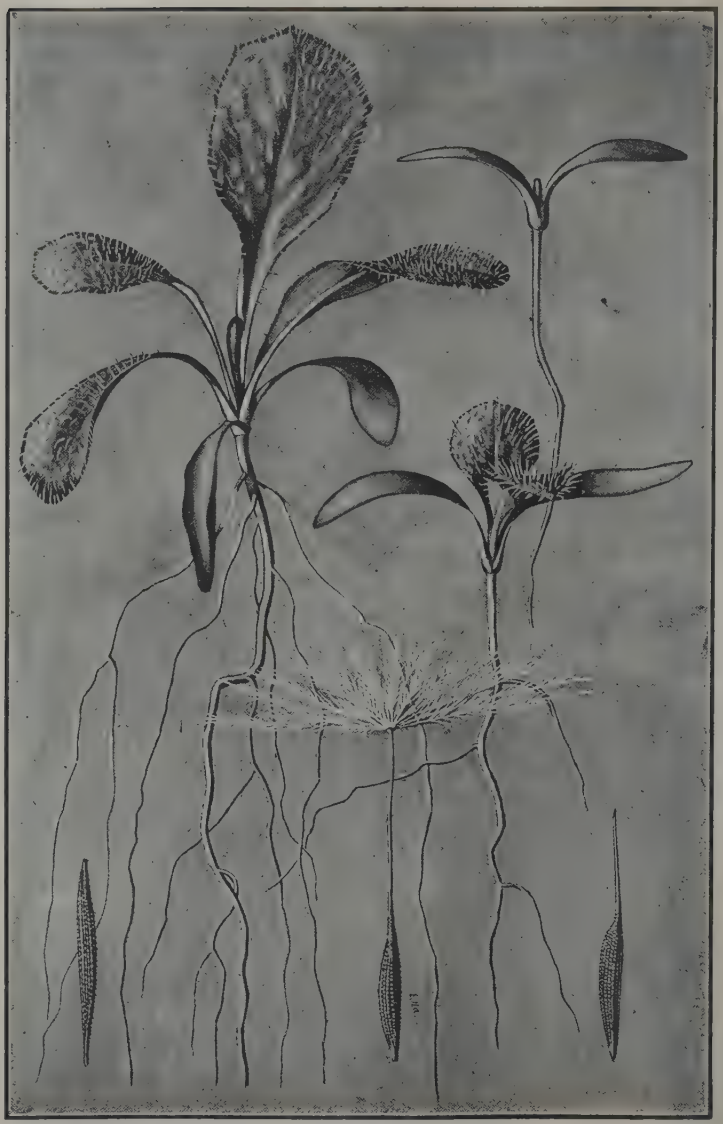
a very definite description of the size and shape of the leaves which, as might be expected in a plant with so great a range of habitats, vary to a very great degree. In the most prevalent forms the leaves may be up to 6 in. long by 1½ in. wide, while in shape they are roughly oblong, but with more or less deeply lobed and toothed margins. In some specimens the indentations reach nearly to the midrib, and the lobes, which are usually narrow and often themselves toothed and indented, are twisted and overlapping. In other forms the lobes are far apart instead of overlapping, while the indentations between them are reduced to broad shallow bays. Between these two extreme forms may be found numerous intermediates, so it will be seen that no description and illustration embracing the entire range can be given. The illustration shows one of the more deeply lobed forms.

The midrib is broad, tapering to the apex, and conspicuous both above and below. Both surfaces are covered with very short stiff hairs, and the leaf, particularly on the upper surface, is rough to the touch.

The flower-stems are leafless and branched, often bearing many flower-heads, though sometimes not more than two. Stems may be seen bearing buds in all stages, expanded flower-heads, and ripe seed-heads.

The flower-heads* consist of a cylindrical involucre up to an inch in length, composed of several rows of narrow overlapping rather dark-coloured bracts. The florets of the head are all ligulate (or strap-shaped), bright yellow in colour, and when fully expanded may spread to a diameter of 2 in. The tip of each ligule is split into several well-defined teeth. The outermost ligules are usually greenish-purple on their outer sides. When the achenes are ripe the involucral bracts spread out irregularly, and the head is then roughly globular in shape, forming what children call a "clock." The achenes, which are of a rich dark-brown colour, are about ⅛ in. long, ribbed with longitudinal toothed ridges, and provided with a slender beak about as long as the body of the achene. This beak is tipped with a tuft of long silky hairs called the "pappus." Each long hair of the pappus is itself clothed with feathery down. Long whitish tapering scales grow from between the achenes and mingle with the pappus.

* It should perhaps be stated that in the *Compositae* or daisy family the so-called "flowers" consist of a cluster of "florets" (each floret corresponding to the single flower of such a plant as the buttercup) surrounded by a cup of floral leaves or bracts called the involucre, the bracts being known as involucral bracts. Each of the so-called seeds in the seed-head or "clock" is called an "achene" or one-seeded fruit, and results from the fertilization of an individual floret.



CATSEAR.

Above, three seedlings of different ages; below, three achenes, middle one bearing a pappus. All magnified 5 times.

Seedling.—The seedling of catsear, when first it appears above ground, bears two seed-leaves, which, as will be seen from the illustrations, are rather long and narrow, and differ besides from all the leaves which follow them in being quite glabrous (without hairs of any kind). The next leaves to appear are broader in proportion to their length, and begin to show signs of the roughened and hairy surface so characteristic of the mature leaves. In slightly older seedlings an irregularity of outline is noticeable in the larger leaves. The illustrations show three stages in the development of the seedling.

Distribution.—Catsear is probably the commonest and most widely distributed weed in New Zealand. It is found in all soils and situations from the North Cape to Stewart Island, and has an altitudinal range from sea-level to over 5,000 ft. The achenes are among the commonest impurities in many New-Zealand-grown agricultural seeds, particularly in those of cocksfoot and the rye-grasses. The beak of the achene is in these cases nearly always broken off by the dressing-machines.

Distinctions between Catsear and Similar Plants.—The following key (which is purely artificial and is in no way suggestive of botanical relationships) shows the principal differences between catsear and those plants with which it is likely to be confused:—

A. Leaves all radical (springing from the root).

I. Flower-stalks not branched.

(*a.*) Leaves glabrous:

Dandelion (*Taraxacum officinale*).

(*b.*) Leaves hairy:

Hawkbit (*Leontodon hispidus*).

II. Flower-stalks branched.

Catsear (*Hypochaeris radicata*).

B. Stem leaves as well as radical leaves present.

III. Heads large with dark centres:

Capeweed (*Cryptostemma calendulacea*).

IV. Heads small, entirely yellow:

Hawkweed (*Crepis capillaris*).

It must be remembered that only the common weeds are dealt with in this key. There are two other species of *Leontodon*, one of *Hypochaeris*, and three of *Crepis*, but they are not sufficiently common to be likely to cause confusion. The Biologist will at all times be pleased to identify any plants that may be sent to him.

CONTAGIOUS MAMMITIS IN DAIRY COWS.

SOME NOTES FOR FARMERS.

C. J. REAKES, D.V.Sc., M.R.C.V.S.

CONTAGIOUS mammitis is a disease of dairy cows which some years since caused very considerable loss to dairy-farmers. Lately it has been troublesome in a less extensive degree, thanks largely to the greater care taken by farmers in using the necessary preventive measures. But the experience of the last two or three years has shown that the process of getting this disease under has come more or less to a standstill, and this is not satisfactory. It seems evident that some further measures are necessary in order to deal with the disease as it needs to be dealt with, otherwise, instead of continuing to aim at reducing the trouble caused by it, we may find ourselves in the position of having to check its increased dissemination. The measures which it is desirable to adopt are — (1) To schedule the disease in the Stock Act, thus rendering it necessary for an owner to notify it should he know of or suspect a case in his herd; (2) to make it obligatory that any cow proved to be affected with the disease be branded with an official brand before she can be allowed to go off the owner's place.

The first measure will enable the owner to get advice and assistance from the officers of the Live-stock and Meat Division in doing the best possible for the affected cow, and in preventing the spread of the disease among the other cows in his herd. The second measure will prevent affected cows being sold to other farmers (through the medium of dealers or otherwise) without the purchaser realizing that he is introducing to his farm an animal which is not only likely in herself to be unprofitable but is also dangerous, seeing that she will prove a centre of infection and likely to be the means of introducing a costly and troublesome disease into his herd. These measures carried out on right lines and with proper judgment should go a long way towards getting the disease properly in hand, and be altogether beneficial, and in no way harassing to dairy-farmers.

In view of the frequent occurrence of cases of ordinary mammitis, distinct from the contagious form of the disease as regards

their possibilities of spreading trouble, but difficult to differentiate from the contagious form by any other means than a microscopical examination of the fluid drawn from the affected quarter, it is recognized that no farmer can be expected to know definitely, when he notices an affected cow, whether she is or is not suffering from contagious mammitis. But the safe rule to go upon is to treat every such cow as being a possible source of danger until she is proved to be otherwise, and, pending the definite result of the microscopical examination, to take every precaution to prevent the spread of possible infection from her to other cows.

The article on mammitis published in the *Journal* for January, 1914, is being reprinted in leaflet form, and will shortly be available, free of charge, to any one applying for it.

During the recent Conference of the Council of Agriculture in Wellington a delegate from a dairying district asked whether it was correct that the Government had been giving a trial to a certain patent medicine alleged to be a cure for contagious mammitis, and had found it successful. This statement was said to have been made by a seller of the medicine, but, if so, it was absolutely incorrect and misleading. It was understood that the "cure" in question was sold for use in the form of a drench. The only drench I know of which could be relied upon to put an end to contagious mammitis in a cow would be one containing enough poison to put an end to the cow also. I have no reason to believe that the drench referred to above is a poisonous one.

Any farmer who suspects that one or more of his cows are affected with the ordinary or the contagious form of mammitis can receive from the Live-stock Division all necessary advice and assistance by asking for it. The best way to determine whether a cow suffering from mammitis is affected by the contagious form of the disease is to send to the Wallaceville Laboratory a properly collected sample of the milk from the affected quarter or quarters. It is necessary that the sample of milk be collected with every precaution to safeguard against outside contamination, and in order to ensure this the following instructions must be carefully and exactly followed :—

(1.) Small 1 oz. or 2 oz. medicine-bottles are most suitable to contain the sample of milk.

(2.) The bottles and corks must be thoroughly cleansed and then boiled in clean water for ten minutes. At the expiration of this time the vessel should be set aside, covered, until the water has cooled sufficiently to allow the fingers (which must be perfectly clean) to grasp the bottle by its base. It should be held upside-down to allow the contained water to drain out. The cork should then be inserted,

the utmost care being taken not to contaminate in any way the insertion end of the cork. The bottle is then ready for use.

(3.) Thoroughly wash the hands, and the udder and teats of the cow, using clean warm water without the addition of any disinfectant.

(4.) Discard the first two or three draws, and then fill the bottle by milking directly into it, taking care that the cork while removed from the bottle is kept free from outside contamination.

(5.) Cork immediately, taking care not to soil the insertion end of the cork by handling.

(6.) Label each bottle with a distinctive number or name of the cow and the quarter from which the sample of milk is obtained, viz. :—

R.F.—(right fore quarter).
R.H.—(right hind quarter).
L.F.—(left fore quarter).
L.H.—(left hind quarter).

(7.) Pack securely, and forward at once addressed to the Officer in Charge, Veterinary Laboratory, Wallaceville. A covering letter giving particulars of the case should also be sent, *but should not be enclosed in the packet containing the samples*. If possible, avoid sending samples so that they arrive at the end of the week.

CONTROLLING FACTORS IN APICULTURE.

F. A. JACOBSEN.

WHEN attacking a new interest in the scheme of life, especially one involving capital, it is advisable to concentrate on the controlling factors and find out all about them. In beekeeping there are many things to study, some of them amounting to problems, and it would be helpful to many beekeepers if they fully grasped the advisability of carrying on their occupation guided by practical business methods.

BUSINESS METHODS AND SYSTEM.

Make every post a winning one. Use labour where it is necessary and in its due season, but do not waste time on what is not practical. The manner of approaching the problems of the industry will, in a measure, determine the result. The extremely interesting influence of the apiary under ideal country conditions has a tendency to eliminate the crude association of business, and half-hearted attention to this important matter is derogatory to the best interests of the business as a whole. For this reason I am very glad that a honey-producers' company is now in operation in the Dominion, which will assure the beekeeper the highest remuneration for his product without the attendant worry

to himself. This is only one side of the question, however; another is system. Without system any commercial enterprise suffers from unnecessary loss which may eventually result in disaster. In beekeeping system must be very real in order to avoid chaos, and it means the mapping-out of work twelve months ahead. It is akin to success. Weather-conditions being satisfactory and normal, the work must be gone through *without fail.* Procrastination forms no part in the scheme of beekeeping.

UNIFORM HIVES.

Uniformity plays an important part in successful bee-management. I have known apiarists suffer severe financial loss in changing some portion of their equipment to suit another portion—the result of buying apiaries with hives of a different pattern from their own. "Start right and keep on the track" is sound advice. Select the hive suited to your district, either the ten- or twelve-frame size, and for economic reasons, such as handling, do not mix the two. Sometimes a cheap apiary is tempting, but unless the odd size is placed distinctly apart loss of time will be occasioned and your temper will also suffer in consequence. All frames should be interchangeable from one hive to another, and beekeepers making their own should adopt the exterior standard size. Of the several kinds of frames in general use, probably the self-spacing staple-spaced is the best under all conditions—due to the ease and rapidity with which it can be removed from the hive. Commercial bee-men would also find it to their advantage to wax the foundation into their frames instead of the old way of wedging it: it is not nearly so liable to drop out of position when handling. The old method is more suitable for the novice, who has more time at his disposal to effect repairs of this nature. It is hardly necessary to remark on the advantages of using the self-spacing frame.

The parts of the hive need not be enumerated. A good cover is, however, necessary on all hives, and one that has stood the test, and which I have frequently recommended, is the zinc-covered telescope kind. I do not wish to condemn any other variety that has been found waterproof and durable, but this one has an advantage the others do not possess. In the robbing season, after its removal from the hive it is placed flat on the ground, and supers may be placed directly on top or, if more convenient, on the top of an adjoining hive, thus forming a complete protection from the adventurous spirits of the apiary. This is often of inestimable value.

SUFFICIENT EQUIPMENT.

An apiary suffering the lack of sufficient equipment, especially in the nature of supers and frames, shows very bad management and want of foresight. "Be prepared" should be the slogan of all those who wish to make a success. One seldom knows when a big honey-flow is approaching, and when discovered it is too late to order necessary supplies. Circumstances of this kind often result in severe monetary loss; had supplies been available they would have covered their cost several times over.

THE RIGHT STRAIN OF BEES.

Not less in importance to the factors previously mentioned is the selection of the most vigorous, hardy, and disease-resisting strain of bees. It costs no more, requires no more work or intelligent labour, and takes no more time to attend in a proper manner to the one than to the other. Why keep the bees instead of letting them keep you? It is true there are sluggards in all races of *Apis mellifica*, but when these are weeded out it is my conviction that leather-coloured Italians are superior to the remainder. It is claimed, and with truth, that they are so vigorous as to resist a mild invasion of one of the greatest enemies known to apicultural science—namely, American foul-brood (*Bacillus larvae*). For this reason alone they should be employed to gather the nectar of this country, but in addition they are honest, hardy workers, prosecuting their ambition to advance the wealth of the hive earlier in the morning and later in the evening than other domestic species. This occasion is not propitious to advance the claims of other races; suffice it to say that due recognition of this valuable Italian strain is of daily occurrence.

THE INDIVIDUAL COLONY.

The inventive genius of ancient contributors to bee lore has no parallel. The sex assigned to the ruler of the hive in those days varied according to that of the ruling sovereign of the country, whether male or female. To-day we know the hive to be ruled by the most socialistic principles of democracy. A queen there is, a marvel of creation, but she is absolutely under the influence of her progeny. She lays eggs of either sex at will, and according to her prolific fertility depends the building of a powerful colony. What wonder then if, left to nature's control, the wealth of a colony is often so small? Here the beekeeper must work hand-

in-hand with nature, and supply to the colony, at a period not longer than two years, a young queen reared from the best stock in the apiary. This is necessary for a number of reasons, the principal being—(1) To promote the general welfare of the colony and ensure strength in numbers; (2) to lessen the danger of swarming, which the bees are more apt to carry out with an old queen; (3) to evade the delay, waste, and loss of time occasioned by the bees superseding an old queen. It is thus plain to the beekeeper that he cannot afford to neglect the queen-rearing branch of the science.

ELIMINATION AND CAUSES OF NATURAL SWARMING.

One of the most troublesome yet necessary practices of the bee-farmer is to prevent his colonies swarming. The autonomy of a colony would give greater trouble and less profit than does guidance by a beemaster's hand. Swarming means the dividing of forces to start a new home in addition to the old one, hence less bees in the old establishment to gather nectar. There are also other reasons too numerous to mention why swarming should be controlled. Remedies will suggest themselves in the close study of causes, some of which are as follows: (1) Bees with an old queen are more inclined to swarm than others; (2) some strains of bees are more inclined to swarm than others; (3) it is nature's way to perpetuate the race; (4) when superseding an old queen swarming sometimes occurs; (5) supers crowded with honey and no room for expansion, and the flow still on; (6) weather-conditions; (7) a slow continuous flow of nectar; (8) insufficient ventilation of the hive; (9) brood-nest too small; (10) brood-nest honey-bound, causing insufficient laying-room for the queen.

GENERAL.

The foregoing combined are essential elements in practical bee-keeping, and they cover a very wide field of study and application. I have not mentioned location, as the Dominion affords a wide choice, and there are few districts that could not produce a marketable product. It may be added that the "man behind the gun" must be resourceful, patient, and something of a carpenter, so that he may be able to cope with the many complexities of the craft. In an article to follow I will endeavour to explain methods that may be used for the ultimate benefit of the apiary as a whole or the individual colony.

THE CHEESE POSITION.

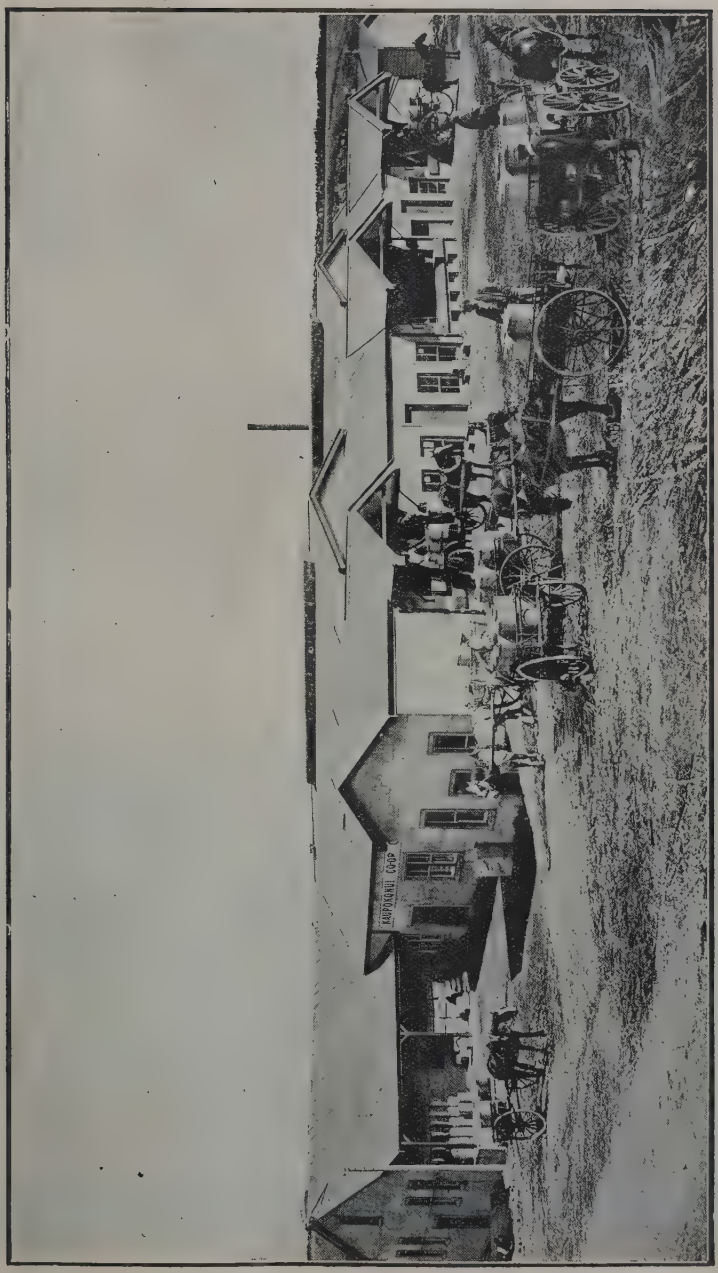
D. CUDDIE.

THE outstanding feature in connection with the dairy industry of New Zealand during the past decade — and, more particularly, during the latter part of that time — has been the enormous development in the production of Cheddar cheese. The extension of this branch of dairying has, in fact, been phenomenal, and, what is more, the movement is still going on as briskly as ever. In order to show the rapidity of this development it is necessary only to mention that the export of cheese in the year ended 31st March, 1905, was 82,421 cwt., as compared with an export of 794,779 cwt. for the corresponding period of the year 1914–15. These figures represent an increase of 864 per cent. in a period of ten years. Another idea of what such an immense quantity of cheese represents may be arrived at when it is realized that it has cost the sum of £185,448 to pay the freight, at ½d. per pound, for the carriage alone of New Zealand cheese to the British market during the last year quoted.

It can now be claimed that the cheese exported from this country plays a very important part in furnishing British consumers with their supply for eight or nine months in the year. That the New Zealand output is now a big factor towards regulating the value of cheese on the Home markets goes without saying.

The number of cheese-factories in the Dominion has risen to 327, no fewer than twenty-six having been added to the total during the year. As the result of the profitable nature of the undertaking, many new cheese-factories are already in course of erection for the coming season, the majority of these being provided by dairy companies that have previously been engaged in the manufacture of butter. It is estimated that from thirty to forty such changes to cheesemaking will be made within the next few months.

Just how long it will prove to be an economic advantage to continue this change of policy in favour of the manufacture of cheese it is impossible to say, but the wisdom of carrying it a great deal further may well be questioned. Some of those who have closely studied the situation have expressed the opinion



A SOUTH TARANAKI CHEESE-FACTORY.

that in the not-distant future the production of cheese will be overdone. These people may be right; but who can tell, with any degree of certainty, what the actual position in regard to the value of cheese will be even a year hence?

At the same time it can hardly be expected that the wide margin of difference in the relative values of cheese and butter will continue for very much longer. It stands to reason that any two products which are both made from the same raw material cannot be sold indefinitely at prices which show such a wide variation. In the meantime, however, those who are now entering into the cheese business are likely to secure a share of the extra profits, for there is every indication of high prices being obtained for at least several seasons to come.

The only immediate danger in connection with our cheese industry appears to be in allowing the quality of the article to fall off; but so long as precautions are taken to guard against this possibility, and so long as every effort is made to improve the flavour as well as the make of the cheese, the producers in in New Zealand can depend upon receiving its highest market value. Only in this way can the producer bring to bear any influence upon the prices for their product. The rest may, speaking generally, safely be left to the law of supply and demand.

THE WEALTH OF THE LAND.

TESTS OF SPRAYING-COMPOUNDS: LIME-SULPHUR.

T. W. KIRK, F.L.S.

DURING the last few seasons the Orchards Division of the Department, through its Instructors working in conjunction with the leading fruitgrowers of the various districts, has been testing the efficacy of new spraying-compounds which from time to time appear upon the market. The results of this work should eventually be of considerable value to the fruitgrower. It is quite expected, of course, that many of the compounds tried will prove to be, if not altogether valueless, not up to the standard of the sprays already in use. But even this is valuable information, as it is quite as necessary to ascertain the inferior as it is to know the superior sprays.

In the Hawke's Bay District the work has been carried out through the Fruitgrowers' Association. Early in the season the association appoints a committee the members of which agree to set aside a number of trees for the purpose of spray-testing; these combined afford a sufficient number of trees on which to carry out the work. The committee, together with the Orchard Instructor, meet and draw up a programme for the season. The supervision of the work is left in the hands of the Instructor. At the close of the season a report is drawn up covering the work done. In this way a large amount of useful work can be accomplished at a minimum amount of loss to any one grower. Other districts also work more or less on this method.

Up to the present a fairly large number of spraying specifics have been tested in this way, a number of which were reported upon in the January, 1915, issue of the *Journal*. With others the test is incomplete, but they will no doubt be reported upon at a later date. A number of the sprays tested, although fairly satisfactory for one purpose or another, failed to give anything like the results claimed for them, while a few failed altogether. On the other hand, several brands gave very satisfactory results and bid fair to become valuable acquisitions to our present list of useful sprays. The lime-sulphur solution which forms the subject of this article is included among the latter.

Lime-sulphur is a commercially prepared compound possessing insecticidal and fungicidal qualities, and was introduced to this country from America a few years ago. At that time Bordeaux mixture was, and no doubt still is, the very best fungicide available for most purposes. But the disastrous russeting effect that Bor-

deaux undoubtedly has when applied in the summer, particularly on many of the tender varieties of apples, was such that the introduction of a safe and reliable substitute, such as lime-sulphur was recommended to be, was hailed with delight by practically every fruitgrower in the country.

Each packet bore the American recommendations for use, 1 in 10 for winter and 1 in 33 for summer. It was very soon ascertained, however, that, for unexplainable reasons, the susceptibility of the foliage of New-Zealand-grown trees to spray-scorching as compared with those of America was such as to be almost unbelievable, for where the spray was used at the strength given, and even at a very much reduced strength, the result was disastrous to both fruit and foliage. In this way the pioneers in the use of the lime-sulphur spray suffered considerable loss. One grower estimated his loss in fruit alone at £150. Subsequent reports from America go to show that these conditions are not peculiar to New Zealand alone. There are certain fruitgrowing sections in that country where lime-sulphur cannot be used with safety at anything like the strength generally recommended.

As might be expected after their first experience, our growers for a time were inclined to look with suspicion upon lime-sulphur as a summer spray, and had it not been for the absolute necessity of substituting something for the Bordeaux mixture they would have been inclined to leave this new compound severely alone. This position resulted in lime-sulphur being taken up and exhaustively tested. The tests have covered practically all strengths and almost the whole of the orchard diseases. The knowledge thus acquired is very encouraging, and is likely to have the effect of re-establishing this spray in the confidence of the fruitgrower. This would no doubt lead to a considerable reduction in the use of Bordeaux mixture as a summer spray and a corresponding reduction in the damage caused by this otherwise valuable fungicide.

Commercial lime-sulphur has a specific gravity of 33° Beaume test, and is put up in vessels ranging from 1 gallon upward. These are usually American gallons, five of which are about equal to four imperial gallons. The cost per gallon in bulk is about 1s. 9d.

A home-made solution equally effective, although somewhat lighter in specific gravity, can be made on the following formula at a considerably reduced cost:—

Sulphur	100 lb.
Roche-lime, 95 per cent. pure	50 lb.
Water	50 gallons.

Slake the lime with hot water, mix sulphur to a paste and add it to the lime, also sufficient water to make up to 50 gallons.

Boil vigorously in an iron boiler of sufficient capacity to prevent waste from boiling over, and add water to replace waste from boiling, so that there will be about 50 gallons when cooked. Solutions made in this way usually register 27° or 28° Beaumé. In order to secure a standard strength corresponding with the commercial solution it is essential to ascertain the specific gravity of the mixture before dilution. For this purpose a Beaumé hydrometer is recommended. Test the mixture, compare with the following table, and dilute accordingly.

Beaumé Degrees.	Specific Gravity.	Winter Strength.
34	1·302	1 to 11 of water.
32	1·279	1 „ 10 „
30	1·259	1 „ 9 „
28	1·236	1 „ 8 „
26	1·215	1 „ 7 „
24	1·196	1 „ 6 „
20	1·158	1 „ 4 „

When diluted as above the whole are of equal strength. To further dilute these to a summer strength an equal quantity of water would have to be added to each.

The strength at which the commercial article is recommended to be used for the control of the various diseases is given in reports from the Hawke's Bay and Nelson Districts, made by Messrs. J. A. Campbell and G. Stratford, Orchard Instructors for those districts respectively.

THE HAWKE'S BAY TESTS.

The following is a summary of the lime-sulphur tests carried out during the past two years in the Hawke's Bay District. As indicated, the tests were controlled by a committee appointed by the local Fruitgrowers' Association to work in conjunction with the Department for the purpose of general spray-testing.

The spray was tested on a large variety of apple, pear, peach, and plum trees in both winter and summer for the control of apple and pear scab (black-spot), powdery mildew, leaf-curl of peach, plum-rust, red mite, and mussel and San Jose scales. The strength of spray used ranged from 1 in 10 to 1 in 20 winter, and from 1 in 25 to 1 in 160 summer.

Brands tested.

Sherwin Williams's and Rogers's were mainly used in the work, but the following brands were also tested: "Blue-bell," "Electro," "Whakatu," "Gasselli," and "Kanto Sanso Kaisha." The latter is a mixture made in Japan. No advice can be given on the relative value of the brands used, as no difference could be noticed between them. So far, a selection can only be based upon the specific gravity combined with price per gallon. Therefore for the purposes of this report "Lime-sulphur" refers to any or the whole of the above-mentioned brands.

Leaf-scorching.—Those varieties known to be most susceptible to scorching from the use of Bordeaux mixture or arsenate of lead were also found to be more readily affected by the lime-sulphur spray when used at too great a strength. The greatest strength at which it can be used with any degree of safety on the hardier varieties of apple-trees, such as Dougherty and Ballarat Seedling, is 1–70; average varieties, such as Sturmer, 1–80; medium tender, such as Cox's Orange Pippin, Adams's Pearmain, 1–90; tender varieties, such as American Golden Russet, Scarlet Pearmain, &c., 1–100. On all the varieties mentioned and others of their class it is advisable, however, to use solutions at least 10 per cent. weaker than those quoted. The strength considered advisable for all-round purposes in the Hawke's Bay District is 1–100. This also applies to pears.

Some peculiar inconsistencies occurred in regard to leaf-scorching. Similar varieties grown in different orchards, sprayed at the same strength and at about the same time, were in the one case undamaged, while in the other they were damaged more or less severely. These were not isolated cases, but occurred frequently, only, however, when spraying was carried out at the heavier strengths given above. Such occurrences could only be accounted for by atmospheric conditions, such as connected with spraying in the heat of the day, or by the effect of the night dews on the sprayed foliage. Spraying in the heat of the day should be avoided as much as possible.

Russeting.—Little or no damage to the skin of the fruit was recorded throughout the whole of the experiments. The appearance of the fruit of trees such as the Jonathan was invariably clean and bright. In cases where Bordeaux was used for the purpose of checking as against lime-sulphur the contrast in the appearance of the fruit was very marked.

Red Mite, Mussel and San Jose Scales (Winter).—A strength of spray ranging from 1–10 to 1–20 was used on all classes of trees for these diseases. The results of the tests were quite satisfactory in regard to San Jose scale, but, although partially effective at the heavier strengths, lime-sulphur is not considered as satisfactory as oil emulsions for the control of mussel scale and red mite.

(Summer).—For one or two sprayings only during the summer there are other compounds preferable to lime-sulphur for the destruction of red mite, but when used in combination with arsenate of lead throughout the season it was quite effective in keeping red mite well under control. Two applications at 1–70 and 1–80 during the time the young mussel scale were on the move gave very satisfactory results.

Black-spot (Early Spring).—The strength of spray used on apples at this stage ranged from 1–25 to 1–60; pears, 1–12 to 1–60; and in each case it was applied just as the buds were showing colour. Although little damage was done to the trees sprayed, it is considered inadvisable to use the heavier sprays; 1–30 to 1–35 for apples and 1–25 to 1–30 for pears is fully strong enough to be used with safety.

(Summer).—Owing to the clear hot weather throughout last season it was not a favourable one for testing sprays for black-spot, as little or none of this disease made its appearance; the tests, however, were continued, and the effect on the foliage was noted. All further remarks on the disease are from the previous season's experiences.

A spray of 1–80 to 1–100 acted very satisfactorily in warding off attacks of black-spot both on apples and pears, but was wholly in-

effective in checking the disease after the fruit had become affected. This was ascertained by spraying trees subsequent to an outbreak of the disease on the fruit. In such circumstances Bordeaux mixture may have to be resorted to at any time during a bad season, but to lessen this liability both apple and pear trees should be well sprayed in late winter or early spring with a stronger mixture of either Bordeaux or lime-sulphur.

Powdery Mildew.—The result of the tests proves beyond doubt that lime-sulphur is so far the best remedy we have for checking this disease, particularly when used in conjunction with sulphate of iron. This compound was prepared by dissolving from 3 lb. to 4 lb. of sulphate of iron in water and adding it to 50 gallons of the lime-sulphur spray. Occasional sprayings proved of little use in controlling the disease. The best results were derived from a continual use of the spray throughout the season, combined with a fairly heavy winter pruning and the removal of all diseased tips. The trees should be sprayed just as the leaves begin to show, using the lime-sulphur alone or with the sulphate of iron added at a strength of 1–80 to 1–100, or 1–30 to 1–35 for the combined purpose of controlling both black-spot and mildew.

Plum-rust. A spray of 1-90 to 1-110 was used for this purpose and proved to be fairly satisfactory, but the stronger mixture scorched the foliage somewhat.

[NOTE.—The report on the Nelson tests will be published in the next issue of the *Journal*.—ED.]

A CANTERBURY EXPERIENCE.

Messrs. Thorne Bros., of Woolston, Christchurch, contribute the following notes on their experience with lime-sulphur in conjunction with arsenate of lead :—

Having had remarkable success in spraying for red mite, &c., we would like to publish our experience for the benefit of others. Last spring we purchased a barrel of a well-known brand of lime-sulphur solution, which when tested showed a density of 30° Beaume. This was tried on apple-trees in October at a strength of 1 in 40, but was only partially successful in destroying red mite. We then tried the solution at 1 in 100 in conjunction with the usual arsenate-of-lead spray. This was absolutely successful, but slightly damaged the foliage of one or two varieties. Subsequently we used the solution at 1 in 120 with the monthly arsenate-of-lead spraying. We were delighted with the results ; in spite of the dry season being especially favourable to the increase of red mite our trees looked better than ever they did in any previous year in autumn. The Sturmers especially looked more like spring than autumn, except that they carried a fine crop of fruit.

In combining these two sprays care should be exercised in mixing, and no doubt the slight scorching caused by some of our earlier attempts was due to careless mixing. The best way is to mix the two sprays separately, each in half the total quantity of water, then pour together and apply immediately. The mixture must not be allowed to stand, as some chemical action takes place which increases the liability to scorch the foliage.

The winter spray of red oil is a splendid thing to destroy the winter eggs of the red mite deposited on the trees ; but this is not sufficient,

as the insect will place its eggs on old sheds, fences, and any rubbish which happens to be lying about. The consequence is that the whole orchard is overrun in a few months. This is where the lime-sulphur comes in. We *must* spray with arsenate of lead if we wish to get any saleable fruit, and with the addition of a small quantity of lime-sulphur we have a spray which covers about all the ills to which apples are liable. The arsenate of lead acts for codlin-moth and leaf-eating insects, the lime-sulphur for black-spot and mildew, and the two combined for red mite, mussel scale, aphis, &c. This combined spray is not recommended for pear-trees owing to its liability to russet the fruit, but, strange to say, it does not affect apples in this way. We are convinced that lime-sulphur used by itself is a waste of time and material, but used in conjunction with arsenate of lead it is absolutely effective, and the cost is infinitesimal.

SPRAYING EXPERIMENTS AT RUAKURA.

Mr. A. W. Green, Horticulturist, Ruakura Farm of Instruction, reporting on the orchard work of last season at that station, remarks as follows :—

The outstanding feature is the area devoted to spraying experiments. The effect of the various sprays shows out prominently. After this season's experiments there is little left to doubt the value of lime-sulphur solution. It is very evident that in the past failure has not been due to the quality of the solution or in the time or method of application. Strength of spray used was apparently the cause of unsatisfactory results during previous experiments.

Summarizing the work, experiments with lime-sulphur prove the advisability of using a stronger winter spray and a weaker summer spray. During summer sprays should be applied frequently and at weak strengths. By increasing the winter strength the control of scale diseases is more definite, and by decreasing the summer strength the liability to leaf-scorch is lessened. The spray can be diluted to such a proportion as to bring about this result without losing its effectiveness on fungoid diseases. Further, the total cost of spray material for the year is reduced, which is an item not to be overlooked.

The russeting of apples by the use of Bordeaux mixture in summer was proved over and over again during the season. Trials with lime-sulphur, covering similar trees of the same varieties, demonstrate clearly its superiority in respect to colour of fruit. All trees in the area devoted to variety tests were given Bordeaux sprays in summer, and it is surprising to notice the various effects it has on the fruits of different varieties. Adams's Pearmain, Houblon, Willie Sharp, and Monroe's Favourite became almost unsaleable, while Gravenstein, Scarlet Pearmain, and Grime's Golden Pippin became marked to such an extent as to lose a great deal of their market value.

It is intended during the next season to treat with lime-sulphur alone all varieties which show sufficient russeting to be detrimental. The rule "one tree one spray" was strictly adhered to throughout the past season's experiments. It is proposed, however, to carry out during the current year several tests with lime-sulphur and lead arsenate as combined sprays.

SEMI-OFFICIAL TESTING.

W. M. SINGLETON.

So few of our purebred dairy cows on semi-official test have recently received certificates that we have no illustrations of new certificate-of-record cows to submit for publication in this issue. Quite a number of cows, however, should fully qualify during the spring months, when some good records will be forthcoming.

EILEEN V.

We are now looking forward to the freshening of Manor Beet's Daughter II of Ashlynn, a purebred Friesian cow owned by Mr. C. A. Hopping, of Glen Oroua. She is due to calve subsequent to her testing-period on the 6th August, and, should everything be in order, we shall have the pleasure of granting her owner a certificate on her 365-day production of 18,733·9 lb. milk, containing 863·51 lb. butter-fat. This performance will place her in the premier position so far as New Zealand records are concerned,

and all the more credit is due insomuch as she commenced her test at the age of 3 years 296 days. We hope to publish an illustration of her as soon as she finally completes for her certificate.

The purebred Jersey cow Eileen V, owned by Mr. S. R. Lancaster, of Palmerston North, received her certificate a few months since. She was eight years of age at the commencement of her test, and in 362 days produced the fine record of 491·11 lb. butter-fat. She freshened again within some six weeks after the

ROSES SWEET.

completion of her test, so that her record was produced almost under normal calving-conditions.

Roses Sweet, owned by Mr. F. E. Hellyer, of Dunedin, has been on test for two consecutive seasons. The first season she milked 324 days, and produced during that period 453·57 lb. fat. She freshened again in eight days after the anniversary of the commencement of her test; and again on test in 224 days produced the splendid record of 472·38 lb. butter-fat. She had the misfortune to give birth to a calf prematurely, and this spoiled what promised to be a great production. She is the grandam of Lady of Collingwood, which cow for three consecutive seasons has been

doing remarkable work under semi-official test. Doubtless some of Lady of Collingwood's hereditary factor for the production of butter-fat came from this grandam.

Whinflower is a daughter of K.C.B. and a herd-mate of Roses Sweet. Starting her testing-period at the age of nine years, she produced in 343 days 10,386·85 lb. milk, containing 514·24 lb. butter-fat. When it is considered that she was entitled to milk another twenty-two days the record is certainly a good one. Its value is further enhanced by the fact that for her following

WHINFLOWER.

lactation season she dropped a calf only some nine days after her year was completed. Such records as this should tend to commend the use of purebred bulls of special milking-strain to all dairy-farmers endeavouring to improve the productive capacity of their herds.

An Order in Council dated the 29th July prohibits the export of cattle and sheep from New Zealand to any destination except with the consent of the Minister of Customs, such consent to be granted only on the making by the exporter or his responsible agent of a statutory declaration as to the ultimate destination of the stock proposed to be exported.

POULTRY-FEEDING EXPERIMENT AT MILTON.

THE WHEAT QUESTION.

OWING to the comparative scarcity of wheat and the abnormally high prices ruling therefor, an experiment has been undertaken at the Department's poultry-station, Milton, Otago, with a view to ascertaining whether it is not possible to secure satisfactory results from an egg-producing point of view eliminating wheat from the ration. Since it is recognized, however, that so long as flour is produced in the Dominion the by-products of wheat—namely, pollard and bran—will be available for poultry-food, these were included in both the dietaries laid down for the tests. Briefly, the difference consists in oats and lucerne in one dietary taking the place of wheat in the other. The experiment commenced on the 1st May, and the accompanying tables illustrate the results obtained during the first twelve weeks. These are slightly in favour of the birds fed without wheat both in egg-yield and cost of production.

It will be noted that the birds taking part in the tests comprise twelve White Leghorn and twelve Brown Leghorn pullets, divided into four pens of six birds each, a pen of each variety receiving wheat as part of the ration, while the other pens receive substitutes. The birds of each strain were selected so as to be as nearly as possible of the same age and type, but individual birds have moulted, and this to a certain extent affected the egg-yield. However, considering this fact and the severe climatic conditions under which the tests are being carried out, the results have been eminently satisfactory. It is proposed to continue the experiment over a period of twelve months in all; the above statement may therefore be regarded as the first quarterly report in connection with the same. As will be seen from the table, lucerne chaff (used in the mash) forms a portion of the ration fed to the birds in pens 3 and 4, and as a lucerne-patch could be easily grown on most

poultry plants, the results of the experiment should be very valuable in that connection.

FEEDING EXPERIMENT CARRIED OUT AT THE MILTON POULTRY-STATION FOR THE TWELVE WEEKS ENDED 23RD JULY, 1915.

Record of Eggs laid.

Week ending	Birds fed with Wheat.		Birds fed without Wheat.	
	White Leghorns (Pen No. 1).	Brown Leghorns (Pen No. 2).	White Leghorns (Pen No. 3).	Brown Leghorns (Pen No. 4).
May 7 ..	27	18	26	17
,, 14 ..	32	11	35	23
,, 21 ..	28	8	29	23
,, 28 ..	31	16	28	25
June 4 ..	30	16	27	23
,, 11 ..	26	22	19	23
,, 18 ..	22	26	22	26
,, 25 ..	27	24	29	28
July 2 ..	32	24	28	22
,, 9 ..	30	23	28	21
,, 16 ..	32	26	29	25
,, 23 ..	35	23	28	22
Totals ..	352	237	328	278

Number and Fair Market Value of Eggs laid.

Pens.	Eggs laid.	Valued at 1s. 10d. per Dozen.	Average Eggs per Bird.	Average Value per Bird at 1s 10d. per Dozen.
		£ s. d.		s. d.
No. 1 ..	352	2 13 9·3	58·6	8 11·5
No. 2 ..	237	1 16 2·5	39·5	6 0·4
No. 3 ..	328	2 10 1·3	54·6	8 4·2
No. 4 ..	278	2 2 5·6	46·3	7 0·9

Particulars of Foods used.

Food.	Pens Nos. 1 and 2.		
	Price.	Quantity.	Cost.
	£ s. d.	lb.	£ s. d.
Pollard	8 8 4 ton	72	0 6 0
Bran	8 0 0 ,,	33	0 2 7·5
Maize	0 6 6 bushel	31	0 3 7
Meatmeal	0 14 0 cwt.	20	0 2 6
Wheat	0 6 8 bushel	96	0 10 8
Totals	..	252	1 5 4·5

Food.	Pens Nos. 3 and 4.		
	Price.	Quantity.	Cost.
	£ s. d.	lb.	£ s. d.
Pollard	8 8 4 ton	58	0 4 11
Bran	8 0 0 „	30	0 2 4·75
Maize	0 6 6 bushel	31	0 3 7
Meatmeal	0 14 0 cwt.	20	0 2 6
Oats	0 3 10 bushel	90	0 8 7
Lucerne	8 0 0 ton	31	0 2 2·50
Totals	..	260	1 4 2·25

Comparative Summary.

Pens.	Value of Eggs laid.	Cost of Production.	Gross Profit.
	£ s. d.	£ s. d.	£ s. d.
Nos. 1 and 2	4 9 11·8	1 5 4·50	3 4 7·3
Nos. 3 and 4	4 12 6·9	1 4 2·25	3 8 4·7
Difference ..	0 2 7·1	0 1 2·25	0 3 9·4

The value of eggs from pens 3 and 4 (birds without wheat) was thus 2s. 7·1d. in excess of the value of eggs from pens 1 and 2 (birds with wheat), while the cost of production was 1s. 2·25d. less than that of pens 1 and 2.

IMPORTATION OF FERTILIZERS.

B. C. ASTON, F.I.C.

It has been my yearly practice to present details of the importation of artificial fertilizers from the returns kindly supplied by the Comptroller of the Customs Department. This information is important, and, being compiled from authentic sources, draws attention in an unmistakable manner to the demand in New Zealand for phosphatic fertilizers. Thus, of £480,312 worth of fertilizers, only £27,213 was for potash and £15,662 for soluble nitrogenous manures. A new departure this year is the arrangement of the figures in tabular form, in which the salient features

of the trade may be seen at a glance. This table is printed on pages 142 and 143.

An extraordinary feature is that in spite of eight months' war the imports for the period reviewed — viz., the year ended the 31st March, 1915—are some 16,000 tons (£66,000) greater than for the previous year.

Although the world is practically dependent on German sources for potash fertilizers, the quantity of these imported was only less by 300 tons than for the previous year. Probably the increased quantity of gypsum imported may be due to an anticipated shortage of an increase in price of potash salts, as gypsum (sulphate of lime) makes the inert soil-potash available, and thus acts as an indirect potash fertilizer.

It is to be hoped that the publication of these figures will attract the further attention of owners of phosphate-fields and induce them to compete in this lucrative market, and possibly lower the price to the consumer.

The following is a summary of the kinds, quantities, and values of the various fertilizers imported into New Zealand during the years ended the 31st March, 1915 and 1914:—

	Weight.		Value.	
	Year 1914–15. Tons.	Year 1913–14. Tons.	Year 1914–15. £	Year 1913–14. £
Bonedust	7,966	6,578	52,235	41,870
Bone char	686	665	2,270	2,219
Blood manure	251	311	1,650	2,002
Blood and bone	798	1,245	5,195	8,212
Basic slag	29,385	30,350	97,716	97,589
Superphosphate	54,190	41,582	196,009	151,780
Guano and rock phosphate	23,983	22,093	64,881	56,169
Bernard's phosphate	..	25	..	84
Basic phosphate	..	100	..	350
Phosphate not otherwise specified	841	415	2,875	1,409
Sulphate of potash	1,196	1,088	14,606	13,303
Muriate of potash	13	25	151	300
Kainit	1,962	2,327	6,699	7,871
Potash salts, not otherwise specified	977	1,106	5,757	6,214
Gypsum	6,314	4,374	9,953	6,621
Sulphate of ammonia	590	467	8,640	7,090
Nitrate of soda	545	328	6,411	3,850
Calcium cyanamide	60	110	611	1,169
Sulphate of iron	71	41	367	167
Fertilizers, not otherwise specified	771	192	4,286	1,154
	130,599	114,214	480,312	413,400

IMPORTATION IN TONS OF ARTIFICIAL FERTILIZERS TO NEW ZEALAND FOR YEARS

New Zealand Port of Entry.			Australia.						Belgium.			Germany (including Austria).					Holland.	
			Nitrogenous Manures.	Bonedust and Blood and Boue.	Superphosphate.	Phosphate, n.o.e.*	Gypsum.		Nitrogenous Manures.	Superphosphate.	Basic Slag.	Nitrogenous Manures.	Superphosphate.	Basic Slag.	Phosphate, n.o.e.*	Potash Manures.	Superphosphate.	Basic Slag.
Auckland	..	1915	268	6,360	3,295	26	1,288		5	50	†610	5	10,970	8,639	305	858	3,410	†525
„	..	1914	522	5,364	2,602	576	835		60	1,557	‡8,107	9	3,245	3,319	25	1,545	1,525	..
Poverty Bay	..	1915	..	..	10	..	..		..	..	..	..	50	50	..	5	..	..
„	..	1914	..	..	45	..	..		..	..	..	..	..	..	..	..	..	..
Kaipara	..	1915	..	40	..	..	..		..	..	..	..	..	..	..	..	..	..
„	..	1914	Nil	..	..	..	..		..	..	..	..	..	..	..	..	..	..
New Plymouth	..	1915	20	124	..	200	190		..	..	..	..	900	687	..	220	1,047	..
„	..	1914	5	350	1,160	88	184		..	..	..	..	..	..	..	30	..	..
Patea	..	1915	..	..	..	..	40		..	..	..	..	80	..	..	20	..	..
„	..	1914	..	..	..	..	100		..	..	..	..	..	..	..	..	..	..
Wanganui	..	1915	..	..	1	..	10		..	..	15	..	..	..	..	5	..	50
„	..	1914	5	..	..	..	10		..	..	..	..	..	..	..	..	..	12
Wellington	..	1915	43	20	15	536	496		..	..	20	..	1,345	1,294	210	776	400	..
„	..	1914	39	25	2,738	210	601		..	162	808	..	545	671	..	500	100	50
Napier	..	1915	25	..	..	15	111		2	25	49	..	200	..	25	150	..	..
„	..	1914	..	..	607	105	57		..	160	132	..	..	25	..	10	..	..
Wairau and Picton		1915	..	..	..	..	..		..	..	..	..	12	..	..	..	..	..
„		1914	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..
Nelson	..	1915	18	..	70	10	20		..	..	..	14	75	99	..	55	..	..
„	..	1914	5	..	..	15	19		1	23	100	..	25	237	5	135	..	..
Lyttelton	..	1915	5	..	1,563	..	1,267		..	550	..	..	650	..	..	556	1,000	..
„	..	1914	50	125	3,485	..	1,675		..	..	..	..	50	100	..	245	150	..
Timaru	..	1915	1	..	..	..	..		..	..	50	..	860	125	..	215	1,218	..
„	..	1914	..	..	1,492	70	600		..	5	..	..	..	..	..	133	..	..
Oamaru	..	1915	Nil	..	..	..	..		..	..	..	..	..	..	..	..	..	..
„		1914	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..
Dunedin	..	1915	331	125	79	2	2,539		..	..	25	100	..	50	..	140	25	..
„	..	1914	25	129	495	..	24		..	..	50	..	..	50	..	190	..	..
Invercargill	..	1915	178	454	2,809	775	350		..	..	..	..	25	310	..	894	2,100	10
„	..	1914	4	390	743	40	268		..	..	25	140	3,610	410	..	827	..	..

* n.o.e. means "not otherwise enumerated." † Includes 50 tons

ENDED 31ST MARCH, 1915 AND 1914, SHOWING COUNTRIES OF DEPARTURE.

India.	Japan.	Pacific and Indian Ocean Islands.			Scandinavia.		United Kingdom.						United States.		
Bonedust.	Superphosphate.	Locality.		Rock Phosphate.	Calcium Cyanamide.	Calcium Nitrate.	Nitrogenous Manures.	Superphosphate.	Basic Slag.	Potash Manures.	Phosphate, n.o.e.*	Iron Sulphate.	Nitrogenous Manures.	Superphosphate.	Iron Sulphate.
		Seychelles Islands	..	1,150											
975	..	Society Islands	..	28	..	..	41	6,023	7,131	27	..	..	27	..	..
		Tuamotu Archipelago	..	4,300											
		Malden Island	..	1,190											
1,628	305	*Christmas Island*	..	7,057	60	5	21	7,325	7,333	231	..	40	..	25	..
		New Caledonia	..	520											
		Seychelles Islands	..	2,546											
..	..	..		..	..	..	..	24	85	..	..	..	..	..	..
..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
526	..	..		..	21	..	..	..	3,775	..	..	..	..	..	..
35	..	..		..	..	..	..	..	..	*75*	..	..	..	..	..
..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
..	..	..		..	..	..	75	..	..	..	..	..	..	..	..
..	..	..		..	..	..	*63*	*1*	..	..	..	..	..	..	..
..	..	..		..	37	..	15	829	3,438	..	70	2	6	..	..
..	..	..		..	*15*	..	*5*	*1,348*	*6,929*	*91*	*101*	..	..	*25*	..
..	1,600	..		..	..	..	..	154	195	10	1	..	..	..	..
..	*900*	..		..	*5*	..	..	*400*	*410*	..	..	..	..	..	..
..	..	..		..	..	..	..	80	..	..	..	..	..	..	..
..	..	..		..	..	..	..	*35*	..	..	..	..	..	..	..
..	..	..		..	..	..	32	140	..	..	..	..	..	..	..
..	..	..		..	..	..	*10*	*610*	*343*	*3*	..	..	..	..	..
..	2,205	Madagascar	..	1,190	..	..	..	1,950	1,000	..	175	..	..	..	19
..	*1,818*	..		..	..	..	*10*	*1,070*	*830*	*212*	..	..	*10*	*100*	..
100	2,428	Madagascar	..	560	..	..	..	1,150	350	..	..	..	..	..	..
157	*1,134*	..		..	..	..	..	*1,300*	*237*	..	*100*	..	..	..	..
..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
..	..	..		..	..	..	..	..	*25*	..	..	..	..	..	..
		Straits Settlements	..	3,407											
		Malden Island	..	2,431											
75	..	Madagascar	..	1,098	..	..	..	489	435	10	315	..	201	..	..
		New Caledonia	..	1,449											
		Christmas Island	..	*1,069*											
35	..	*New Caledonia*	..	*1,538*	*5*	..	*40*	*100*	*25*	*80*	*15*	*1*	*90*	..	..
		Straits Settlements	..	2,422											
625	..	Malden Island	..	4,335	..	..	149	762	418	..	..	..	..	..	..
		Christmas Island	..	*1,910*											
250	..	*Malden Island*	..	*3,710*	..	..	*90*	*500*	*200*	..	*150*	..	..	..	..
		Seychelles Islands	..	*1,454*											

phosphates unspecified. ‡ Includes 149 tons phosphates unspecified.

TOMATO-CULTURE.

EXPERIMENTS IN AUCKLAND DISTRICT.

FACILITIES were secured last season by the Orchards, Gardens, and Apiaries Division of the Department for carrying out experiments in both indoor and outdoor tomato-growing in the vicinity of Auckland. The experiments were undertaken at the urgent request of the local growers, and were on the lines previously adopted by the Department in the Christchurch and Wellington districts. The work was carried out by Mr. W. C. Thompson, Orchard Instructor, Auckland, in co-operation with Messrs. B. Fremlin and W. Capes, of Avondale. Considerable interest was taken in the experiments, which proved very successful. The following are Mr. Thompson's abridged reports:—

INDOOR CULTURE.

As directed, I entered into an arrangement with Mr. B. Fremlin, of Avondale, for the use of his tomato-house, measuring 38 ft. by 18 ft., for the purpose of carrying out experiments in tomato-culture under glass and the control of disease, &c. On the 30th July, 1914, 25 lb. of superphosphate was applied evenly to the soil and well dug in. No further manuring was carried out until the fruit was well set.

Plants and Propagation.—The plants used were Palmer's Select, raised by Mr. Fremlin. Owing to lack of time the plants were not raised in sterilized soil, which practice I am convinced is a decided advantage. Nevertheless, they were good, hardy plants.

Cultivation.—The soil was well cultivated throughout, the surface soil being lightly disturbed after each watering.

Watering.—This was carried out daily at about 3 p.m.

Ventilation.—Top ventilation was found to be insufficient, therefore additional ventilation had to be provided. This resulted in a great improvement.

Temperature.—Between the 2nd October and the 20th December the minimum temperature ranged from 43° to 58°, with an average of 48°, while the maximum registered 62° to 90°, an average of 76°.

Humidity.—Lloyd's hydrodeik was used in the house from the 2nd October to the 20th October for the purpose of testing the moisture. The latter ranged from 42° to 72°, with an average of 68°. This proved to be a very useful instrument, and should find a place, together with a reliable thermometer, in every tomato-house, both humidity and temperature being very important points in indoor tomato-culture. Excessive moisture and sudden changes in temperature are responsible, in my opinion, for many failures in the past.

TOMATO INDOOR-CULTURE EXPERIMENT.—THE CROP IN MR. FREMLIN'S HOUSE.

Spraying.—The plants were sprayed with 3-5-40 Bordeaux mixture before planting, and later about every fortnight, commencing on the 8th September and continuing throughout. It has often been stated that continuous spraying with Bordeaux mixture is detrimental to the growth of the plants. This has not been the case in the present instance, as the accompanying photographs will show, nor am I of opinion that it is likely to be at any time if other conditions are properly attended to, provided the spray is carefully prepared and tested before application.

Diseases.—Prior to planting out, and again during the month of November, the plants were slightly affected with tomato leaf-

spot (*Cladosporium fulvum*). An application of the Bordeaux spray on each occasion effectually checked further spread of this disease.

A slight attack of mildew became evident during the month of December. The house was at once dusted with dry sulphur. This had a very decided effect in checking the disease, which subsequently caused little trouble.

Manuring.—For this purpose the house was divided into three plots. As previously stated, the whole received a dressing of 25 lb. of superphosphate prior to planting, no additional manure being applied until after the fruit had set, when the following mixtures were applied :—

2nd September: No. 1 Plot—4 lb. superphosphate, 2 lb. sulphate of ammonia, 2 lb. sulphate of potash; No. 2 Plot—3 lb. superphosphate, 3 lb. sulphate of potash; No. 3 Plot—3 lb. slag, 3 lb. sulphate of potash.

28th November: No. 1 Plot—4 lb. garden fertilizer; No. 2 Plot—2½ lb. slag; No. 3 Plot—2½ lb. blood and bone.

10th December: The whole was top-dressed with 8 lb. sulphate of ammonia and lightly raked in after watering.

The result of this manurial treatment was highly satisfactory in each case. It would be difficult to say which plot of plants bore the most satisfactory crop.

Training.—The plants were grown on the single-stem system. Wires were tightly stretched and attached to ends of the house over each row of plants. A cord was pegged to the ground at the root of each plant and attached to the wire above. Each plant, when sufficiently high for training, was turned around the cord as described in article on "Tomato-culture" by Mr. S. F. Anderson, in the August, 1911, number of the *Journal*.

Crop Return.—By the end of the season 880 lb. of tomatoes had been marketed, realizing £22.

Remarks.—I am of the opinion that in this district satisfactory crops can be grown, providing the following points are observed: Raise for planting, sturdy plants of an approved variety, preferably in sterilized soil. Do not overcrowd when planting; the plants should be set out in rows at least 2 ft. 6 in. apart and 1 ft. 6 in. between the plants. Water sparingly, and late in the afternoon. Pay strict attention to ventilation; excess of humidity is very detrimental to the health and welfare of the plants. A temperature of from 76° to 80°, with humidity test of 68° to 70°, will prove to be the most satisfactory. Spray continuously with 3-4-40 Bordeaux mixture. Prepare the spray carefully, using the best roche-lime and copper sulphate. Test with litmus paper;

the spray should show a slightly alkaline test. Manure moderately with a complete manure.

In conclusion, I wish to express my appreciation and thanks to Mr. Fremlin for his kind assistance throughout, without which it would have been inconvenient for me in the face of other duties to have carried on the experiment successfully.

TOMATO INDOOR-CULTURE EXPERIMENT.—SOME OF THE CROP.

OUTDOOR CULTURE.

This experiment was carried out on a plot of land measuring 150 by 10 yards, secured from Mr. W. Capes, of Avondale. The object of the experiment was to demonstrate the advantages of the principle of training outdoor plants practised by practically all the leading tomato-growers throughout the country, as against the old untrained bush system still adhered to by many of the local growers of this district. The objections raised against training outdoor plants which lead to this experiment are that the

advantages to be gained by any elaborate system of training does not warrant the extra expense and labour entailed.

For the purpose of comparison a plot of equal dimensions adjoining the test plot was planted, and plants grown on the bush system. The ordinary wire trellis was used for training the plants in the test plot. Both plots, so far as the spreading habit of the untrained plants would allow, received equal treatment in every particular, and were attended to throughout by Mr. Capes, to whom my sincere thanks are due for the thorough manner in which he carried out this work.

The final results proved conclusively that despite the extra labour it is most advantageous from every point of view to carefully train tomato-plants grown out-of-doors.

The crops marketed from the respective plots were as follows: Trained plants, 3 tons 4 cwt. 2 qr. 21 lb.; market return, after deducting cost of labour, £31 0s. 2d. Untrained plants, 2 tons 2 qr. 21 lb.; return, after deducting cost of labour, £18 3s. 5d.

GROWING FORAGE CROPS FOR SEED.

It has been feared that the dislocation of farming activities in England and on the Continent of Europe as the result of the great war would give rise to a serious shortage of forage-crop seeds. So far as forage seeds for the coming season's planting are concerned, there need be no apprehension on this score. With the exception of swede-seed, of which there is an undoubted shortage, supplies are likely to be well maintained. Prices, of course, have risen, and in the case of swedes will yet rise considerably. As to what the actual situation with regard to supply will be after the present season it is difficult at this distance to form any judgment. The weight of opinion seems to be that supplies of forage seeds from outside sources will not be far from normal.

Farmers are therefore not recommended to depart from their regular cropping plans in order to embark upon the business of seed-raising to any extent; rather should they direct their efforts to a greater production of meat, dairy-produce, &c., by well established methods. The excellent practice followed by a few dairy-farmers in normal times of growing small areas of mangels and carrots for seed to supply their own requirements is, however, worthy of more general adoption. Our farmers' boys, too, should be encouraged to efforts in the same direction. Apart from the fact that by so doing they may become settled in thrifty, industrious habits, it would be difficult to think of any other way by which they could more effectively do their share of the nation's

work in the critical time looming before it, or gain better educational experience.

As to the probable good qualities of home-grown seed no doubts need be entertained. Much of the forage seed of commerce is grown and harvested by exceedingly rough methods. Considerable percentages of various samples harvested by extensive methods are immature and of low germination energy, particularly in the case of mangel-seed. The home-grown sample almost invariably shows a higher percentage of germination. There is reason to believe also that the actual crop from New-Zealand-grown seed would surpass that of foreign origin.

The following notes may be of service to those who wish to engage in a seed-raising venture during the coming year :—

RAPE.

For the best yields rape requires to be grown on a good strong loam. It may be sown towards the end of the present month (August) in the North Island in order to yield seed in February. This course, however, is not to be generally advised. The crop itself is likely to be indifferent as to yield, and the resulting seed is apt to be inferior for growing for forage purposes. It is better sown late — say, from February to April — allowed to stand over winter, and to come into flower in early spring. In the latter case the seed crop will be ready to harvest in December, or in January in late districts. It should be sown in drills 14 in. to 28 in. apart, at the rate of 1 lb. to 2 lb. of seed per acre, and afterwards thinned out with the hoe so as to allow at least 9 in. between plants. In the case of rape for seed, much wider spacing is advisable than when grown for forage, in order to secure the best results. The reverse practice holds good with mangels, turnips, and carrots, chiefly from the fact that these crops store up enormous reserves of food material in the roots before they produce their seed-stems. Before the seed-pods are absolutely dry the crop should be cut and tied into sheaves to dry, and threshed on a sheet in the field. Protection from ravages of birds may be necessary. When grown on a larger scale it is recommended to drill 14 in. apart at the rate of 3 lb. per acre, and to thin out as well as possible by cross-harrowing when the plant is young. The crop can be handled with a reaper-and-binder and threshed with the ordinary threshing plant. A crop which has been lightly fed off may be reserved for seed by running the ridging-plough at intervals across the direction of drilling, and harrowing afterwards. Half a ton of seed per acre is a good yield. Much higher is possible, and very low yields may result from a small area unprotected against birds.

MANGELS.

The method adopted for saving seed of this crop is to select from the field or the clamp good, firm, shapely, well-developed roots typical of the variety, and plant out in September or October. The selected roots should have their root-system intact — that is, not cut or mutilated in any way—and in particular the crown of the root with the terminal and axiliary buds, which later on produce the seed-stems, must not be injured. The roots should be well set into the ground, not more than 18 in. apart in the rows and 30 in. between the rows. The top of the mangel only should be above ground, as the plant is very liable to be blown over when in seed-head. Staking is a wise precaution on small patches. Mangels are irregular in the development of seed-stems and in the ripening of the seed. When grown in small plots for home seed-supply it is advisable to make more than one collection of seed. On a large scale there is no other alternative than to harvest when the majority of the seed-clusters have turned brown. The yield of seed is very variable, and may be anything from 3 cwt. to 12 cwt. per acre under field-conditions, with an average of about 6 cwt. When planted out in the manner indicated a good root in a rich soil is capable of yielding over 1 lb. of seed.

SWEDES, TURNIPS, AND CARROTS.

These are treated in a manner similar to mangels, excepting that swedes and turnips may be placed at intervals of 12 in. and carrots of 9 in. in the rows. The same precaution should be taken to have the roots intact. Deep planting is advisable. On a larger scale it is convenient to set out the rows on the surface of prepared ground, and earth up by running the ridging-plough between the rows. If it is desired to leave a corner of a crop grown for forage as a seed crop, the plants may be successfully carried over the winter in all but very severe districts by earthing up well with the ridging-plough. The yield of dressed seed averages about 280 lb. for carrots and 600 lb. for swedes and turnips. At the Ruakura Farm of Instruction a netted-in plot of 90 ft. by 12 ft., containing ninety bulbs planted at 3 ft. distances, has averaged about 30 lb. of swede-seed from the plot.

PREVENTION OF CROSS-POLLINATION.

It is absolutely necessary that one variety only of one crop be taken in hand for seed-production at any one place, and care should be taken to prevent any odd garden-plants of the same botanical family from running into flower when the special seed-plot is in bloom.

THE MOUMAHAKI POTATO CROP.

THE following is a report on potato variety trials conducted at the Moumahaki Experimental Farm in the past season, 1914–15 :—

After a cold dry spring the weather was more or less hot and dry through the summer and autumn. The potato crop suffered very little from disease, and the quality was above the average.

Special attention had been given in the previous season to single-plant selection of tubers for seed purposes at the time of lifting, undesirable roots being excluded, and the best kept for stock by this method. The increased yield due to such selection justified the extra cost in labour.

A portion of a field down in Provence lucerne was broken up for the main crop, and the following mixture of fertilizers used : 3 cwt. Seychelles guano, 3 cwt. superphosphate, 1 cwt. sulphate of potash, ¼ cwt. sulphate of ammonia. This was applied at the rate of 10 cwt. to the acre. Planting was done between the 7th and the 10th September ; the rows were spaced 3 ft. apart. Details of yield &c., are given in the appended table.

The King Edward potato is not as well known as it merits. It is kidney-shaped, with pink eyes, white flesh, and of a shapely form, and is considered a second early mid-season variety. At the present time it is quoted at 10s. a ton more than other table varieties on the London market. It was introduced in the year 1902 by Mr. J. Butler, Scolter, Lincolnshire, England, and is the result of a cross between Maincrop and Beauty of Hebron. The haulm is erect, and like Maincrop, being therefore usually planted closer in the drills than the average ; 28 in. rows are recommended for this variety. The King Edward sometimes fails if planted too deep, as the sprouts require air to thicken them as they push through the soil ; afterwards they should be well earthed up.

Gamekeeper proved one of the best varieties this season. In spite of the dry weather the haulm was uniformly strong and filled in the rows, consequently weeds had no chance to grow. Maori Chief, said to be a selection out of Northern Star, did remarkably well. This variety gives a heavy yield of shapely tubers with less supertuberation than Gamekeeper and Northern

Star. Queen Mary, put on the market by Mr. James Gardiner, Perth, Scotland, is under test with other newly introduced varieties.

MOUMAHAKI EXPERIMENTAL FARM, POTATO VARIETY TRIALS, 1914–15.

Variety.	Marketable Tubers per Acre.	Small Tubers per Acre.	Total Yield per Acre.	Disease.
	T. cwt.	T. cwt.	T. cwt.	Per Cent.
Gamekeeper (Canterbury)* ..	23 16	2 16	26 12	..
Gamekeeper (Totara)* ..	16 4	3 0	19 4	3
Gamekeeper (Lincoln)* ..	25 0	1 0	26 0	..
Gamekeeper (Otago)* ..	16 12	3 4	19 16	..
Maori Chief (selected) ..	25 0	2 4	27 4	..
Maori Chief (unselected) ..	19 12	1 12	21 4	..
King Edward (selected) ..	12 0	3 4	15 4	..
Northern Star	14 4	4 0	18 0	..
New Colonist	7 8	4 0	11 8	..
White Rock	7 8	2 16	10 4	..
Eldorado	4 0	3 0	7 0	..
Sir John Llewellyn ..	..	3 4	3 4	..
Patea Gem	9 4	1 16	11 0	..
Commercial	8 16	1 16	10 12	..
Midlothian Early	4 16	2 8	7 4	..
Dobbie's Exhibition Red ..	5 4	3 0	8 4	..
Vitality	8 4	1 8	9 12	..
Dobbie's Favourite ..	6 0	0 16	6 16	..
The Chapman	11 12	1 0	12 12	..
Sharpe's Express	5 4	0 8	5 12	..
Queen Mary	7 12	0 16	8 8	..
The Provost	8 0	0 12	8 12	5
Le Breton	4 0	1 4	5 4	..
Sutton's Abundance ..	10 16	2 0	12 16	..
Red Rock	6 8	2 8	8 16	..
Emperor	8 16	3 4	12 0	..
Sparke's Victoria	3 0	1 12	4 12	..
Gold Coin	2 16	0 16	3 12	..
Palmer's Prolific	6 0	0 16	6 16	..
Runciman's Purple ..	7 4	2 0	9 4	..
Fidler's Eclipse	5 0	2 8	7 8	..
Monarch of France ..	3 16	1 8	5 4	..
Up-to-Date (North Island) ..	11 12	3 4	14 16	1
Up-to-Date (South Island) ..	14 0	3 0	17 0	1
Imperator	9 8	2 8	11 16	..
White Elephant	5 4	1 16	7 0	25
Waimarie	6 8	1 12	8 0	..
Brownelle's Beauty ..	4 0	1 8	5 8	..
Derwent	6 12	1 4	7 16	..
Holditch	10 4	2 8	12 12	..
North Pole	8 0	2 0	10 0	..
Skerry Blue	11 4	1 8	12 12	..
Star of New Zealand ..	10 8	2 8	12 16	..
Paulsen's Blue Giant ..	13 0	0 8	13 8	..
Beauty of Hebron	10 12	1 0	11 12	..

* District from which seed was originally obtained.

By a Commonwealth Proclamation dated the 26th June, 1915, the importation of citrus plants from any part of the world into Australia is prohibited. The prohibition does not apply to citrus fruits.

FORAGE FOR THE EXPEDITIONARY FORCES.—CORNER OF STORE, WELLINGTON.

WORK FOR THE COMING MONTH.

NEW ZEALAND is a country of wide variation in climatic and soil conditions. In applying suggested procedure it is, therefore, necessary for the farmer to amend it to suit local weather-conditions and the requirements of his soil—information which can best be ascertained by a study of these problems on the part of the farmer himself. Nothing can take the place of local knowledge. Little advice on an agricultural subject is capable of general application in its entirety.

THE FARM.

J. DRYSDALE.

THE yearly increase in the price of land and the yearly decrease in the amount of feed from old pasture are factors which demand the close attention of every farmer. No doubt in parts of the Dominion specially adapted for the growing of grain advantage will be taken of the high prices ruling, and a larger area than formerly will be put under cereals. The return from this class of farming may more than balance the increased price of land; but the position of the dairy-farmer and grazier is somewhat different, particularly in the North Island. Large areas, although of good soil and arable, have never got beyond the grazing stage, and are to-day carrying less stock per acre than when land was 25 per cent. cheaper.

Something, then, must be done to provide more feed or fodder in whatever form is best suited to the farmer's conditions. Not only should old grass fields be renewed, but suitable catch-crops should and can be grown. With the favourable climate of the North Island there is no reason why continuous ample feeding should not be available during the whole of the year, increasing the butter-fat and the "mutton-fat." What will increase the one will increase the other. Feed, and how to make good use of it, is one of the first and most important subjects for the farmer's attention. No matter what the breed, pedigree, or any other good quality of his stock, without a plentiful supply of feed, not only for a few months but for the whole year, the owner is not doing what the animal demands in order to produce the best results. What is gained, probably at a high cost, by special breeding may

be lost by want of sufficient feed, shelter, and kindness for the animal.

It is also important that grass-fields should not be fed off too close during the winter months. It is not reasonable to expect that fields will recover in the early spring, after being heavily stocked all the winter, in the same manner as those that have been spelled or lightly stocked during the months of June and July. Sufficient rest must be given the field to recover, particularly if the pasture is old; young pastures will make early and vigorous growth in spring long before there is any apparent growth in old pastures. Old pastures should be harrowed with a sharp-toothed tripod harrow, which will cut up and spread all droppings, and at the same time allow sun and air to penetrate, giving the grass a much quicker growth. Old pasture, under favourable conditions, could be improved by giving one—or more if necessary—turn with the disk harrow, afterwards sowing 1 bushel Italian rye-grass per acre and covering with the chain harrow. July and August are the best months for this operation. Italian rye is a vigorous grower, and holds an important position as a milk-producer. This must not be looked upon as a permanent measure, but only as temporarily increasing the feeding-value of the field until it can be ploughed and cultivated with a rotation of crops, and eventually sown with a proper mixture of grasses.

Top-dressing with lime or artificial manures should be carried out without further delay.

Early potatoes should be planted. By planting near the surface instead of following the usual method of deep planting there is not the same danger of tubers rotting; at this level, moreover, the soil is dryer and temperature higher, which is necessary for early and quick growth.

Oats and spring wheat should be sown. Algerians are good for chaffing, although some of the white oats are preferable for grain. On heavy rich soil Algerians are liable to lodge; Gartons, being stronger in the straw, are more suitable for rich ground. Among the varieties of wheat grown at the Weraroa Experimental Farm Purple Straw Tuscan gave the best results; this is a spring wheat, and a strong, vigorous grower.

Ground should be ploughed and fallowed for sowing later with mangels, turnips, lucerne, and maize.

Turnip crops should be fed off not only in order to secure high prices ruling for fat stock, but because after August the feeding-value decreases with all varieties except swedes. This operation

will allow the fields to be made use of for sowing of grain crops, also later on for grass and rape.

Hedges and plantations should be trimmed. With the sap coming up they recover quickly, and there is less danger of the plants or trees dying.

Ewes are now lambing, and every attention should be given them — not only assistance, if necessary, but frequent changes to clean pasture. This need not be necessarily rich or long pasture. It is really more important on very rich pastures to make frequent changes, otherwise the percentage of deaths may be high. In several districts for the last two years deaths of lambs were not chiefly due to the scarcity of feed or ewes not having sufficient milk; in most cases the losses occurred among the biggest and best-conditioned of the lambs.

THE ORCHARD.

J. A. CAMPBELL.

To the orchardist each month provides its quota of work. In many cases, particularly toward the end of the dormant season, the orchardist finds he has on hand considerably more than a fair quota. To what extent this applies depends largely upon the system of management. It is not an uncommon thing to find growers with so many unfinished jobs on hand that they are at a loss which way to turn to satisfactorily complete them all before the spring growth commences. This is a very unsatisfactory position, and should be guarded against at all costs, as it not only leads to confusion but is very apt to materially affect the quality of the work ultimately carried out.

Judging by the past, many orchardists will have on hand one or more — usually more — of the following jobs still incomplete: Pruning, oil-spraying, planting, and the general cleaning-up of prunings, besides the usual work of the month, comprising cultivation, spraying for black-spot, &c. It must not be forgotten that there are only a few weeks before a general bursting of the buds will take place, so no time should be lost in finishing off all such work.

CULTIVATION.

The work of pruning, spraying, cultivation, and harvesting of crop constitute the leading features of importance in orchard-

management. These matters, when carefully attended to and taken in conjunction with adequate shelter, provide the main essentials to successful orcharding. But to ensure this success it must be remembered that the whole of these matters depend one upon the other, and the whole must receive adequate attention. An orchard may be well sheltered, pruned, and cultivated, and at the same time result in failure through insufficient spraying. Heavy winter pruning to promote strong growth may be resorted to, and the results aimed at may fail to materialize through the trees lacking sufficient moisture owing to the want of proper cultivation. The same applies to a great extent in each case. Neglect any one of the essential features mentioned, and the result under ordinary circumstances must very materially affect the success of the whole, and the profits of the orchard suffer accordingly.

Of the several important branches of the work mentioned, that of cultivation is not of the least importance. Failure in this direction not only affects the growth of the tree but also the development of the fruit. Under favourable circumstances of soil and climate an uncultivated orchard may thrive and bear good crops of fruit for some time, but such cases are exceptional. The average orchard treated in this way rarely thrives for long; sooner or later the diminishing supply of plant-food in the soil becomes plainly evident both in the appearance of the tree and in the quality of the crop, particularly when acted upon by anything like a severe drought. A severe drought will to an extent affect fruit-trees grown in cultivated land; but a moderate drought has in many cases a beneficial effect on trees grown under such conditions, providing the early spring cultivation is deep and thorough, and the subsequent surface cultivation for the retention of moisture is frequently carried out.

Cultivation aerates and sweetens the soil, makes available fresh supplies of plant-food, regulates air and moisture within the soil, and otherwise provides the conditions under which beneficial soil-bacteria thrive. Cultivated soils more freely admit water and more readily drain away surplus supplies than do uncultivated soils, thus providing for the fullest advantage being taken of the season's rains.

Overcultivation in the form of ploughing, particularly when carried out during the summer, has the effect of destroying humus, and is therefore harmful. The orchard requires two good ploughings per year only, one in autumn and the other in early spring. It is unwise to plough when the soil is wet and cloggy; rather wait until it is in a free but fairly moist state. It is also unwise to delay the ploughing until after the hot weather

sets in, as the excessive evaporation of moisture prior to and whilst the work is being carried out may result in the soil being too dry.

The second and final ploughing for the season, usually done during this month, should be thorough in every particular. This is usually termed "cross-ploughing" — that is, it is carried out across the lands made at the previous ploughing. But whether cross-ploughing is practised or not depends mainly upon the system on which the trees are planted. The soil is usually turned in to and away from the trees in alternate seasons, but whichever way this is done the disks should be set in such a way as to best level up the work.

After ploughing, the soil should be worked down with the disk and harrow to a fine tilth. How soon after ploughing this should be done depends upon the nature of the soil. With some soils this is not a vital question: the work can either be done immediately or left for some time. But no such latitude is allowable in the case of heavy soils. These if not too wet should be worked down immediately after ploughing, otherwise the soil will bake hard and become almost impossible to work.

SPRAYING.

Where the Bordeaux mixture or lime-sulphur is intended to be used against apple and pear scab, the work will have to be attended to during this month. For this purpose lime-sulphur is recommended at the rate of 1–10 to 1–12, and Bordeaux mixture at 10-10-40. In either case apply thoroughly when the buds begin to swell.

Oil Sprays.

The successful use of oil sprays during September is governed by the development of the buds. If these are at all advanced they are liable to damage from the use of a strong oil spray. In such circumstances the use of lime-sulphur would for many reasons be preferable.

In regard to oil sprays generally, judging by letters received, some doubt seems to exist among growers as to what is really meant by the various strengths recommended, especially in the case of oils emulsified at home after the formula given in the Department's leaflet. In explanation I might say that in all cases of oil sprays the strengths recommended are based on the actual oil used in the mixture, not on the bulk on hand after the emulsification has taken place. In the case of prepared oils

the dilution is based on the bulk, as the small amount of water present in these is not sufficient to affect the result.

Black Aphis.

This insect is very prevalent in some localities, where its disastrous effect on peach and Japanese plum trees is well known. In such affected districts the aphis usually becomes evident early in the spring. In the past, various sprays have been tried for the control of this pest, but the tender nature of the foliage of the peach greatly restricts the number of suitable sprays available. For some time tobacco-wash and McDougall's Insecticide have been the most popular sprays for this purpose, but I am of the opinion that Vistolene when used at 1–100 will give far more satisfactory results.

Peach Leaf-curl.

Spraying for this disease should have been attended to last month, but unfortunately there are growers, usually those in a small way, who fail to realize the necessity of spraying for leaf-curl until after they notice the affected foliage of their trees. Then the usual annual question comes of "How can the matter be remedied?" At this stage there is no remedy. The remedy is the application of Bordeaux mixture or other fungicide before the leaves appear. However, early in this month, although the trees may be in full bloom, choosing the lesser of two evils in preference to leaving the trees unsprayed, I advise the use of a weak solution of Bordeaux, although some damage may be done to the blossoms and young leaves.

Citrus Trees—Scale.

Spray citrus trees affected with scale with oil emulsion, 1–20 to 1–25. Apply thoroughly, taking care to cover both sides of the leaves and small wood.

Fungus Disease.

Spray with 4-5-50 Bordeaux mixture for fungus diseases attacking citrus trees. Repeat once or twice during the spring.

PLANTING.

The planting of stone-fruits generally should be completed before blossoming, but weather-conditions are sometimes such as to prevent this. In these circumstances planting can be continued with safety, but should be completed as early as possible. Generally speaking, pip-fruits can be safely planted throughout the month.

THE POULTRY-YARD.

F. C. BROWN.

WORK FOR SEPTEMBER.

SEPTEMBER may be considered the busiest month of the year, for it is then that the hatching and rearing of another season's stock should be in full swing. When a considerable number of chicks are required, and the plant is not a large one, it is obviously impossible to hatch the full complement at the ideal time. Before the end of September all the heavy breeds should be hatched out, and no time should be lost in filling the incubators and nests with eggs from the lighter breeds. The object of the poultry-keeper should be to have the hatching operations over before the middle of October, so that the young birds may be given an opportunity to attain a complete development while the days are long and the weather-conditions favourable. When winter eggs are the objective in view the most profitable stock are those hatched during August and September—the heavy breeds in the former month and the lighter breeds in the latter. Birds hatched too early—say, in the first week of July—are generally undesirable, for they mostly commence to lay in the cheap-egg season and moult later with the adult fowls, just when the dear winter egg is expected. Of course, where it is intended to breed from cockerels and pullets the following season the July-hatched bird is more desirable for this purpose than those hatched later, owing to its greater development and seasoning. It may be well to emphasize that, owing to late-hatched chicks having often to contend with hot, trying summer weather, followed closely by cold autumn snaps before they are nearly matured, they cannot be expected to make the necessary growth or to be heavy profit-makers.

INCUBATORS.

Many beginners will be making their first attempt this season to work an incubator, and would doubtless welcome hints through these notes regarding its management. As, however, there are so many different makes of incubators on the market and methods of operating, it is practically impossible to give detailed instructions that will apply to all machines alike. These are rules which may apply to all systems of artificial incubation, but even when these are strictly adhered to the best results will not be obtained unless the breeding-birds have been maintained in a strong, vigorous con-

dition in order to enable them to produce a high percentage of strong germs and hatchable eggs. The beginner would be well advised to follow closely the usual book of instructions supplied by the makers, who in most cases would naturally give their machines severe tests before putting them on the market. Of course, the novice should not wholly depend on theoretical knowledge, but should endeavour to find out things for himself. For instance, when artificial incubation is being tried for the first time it is best to test the machine with a few eggs before the main work is entered upon. A simple test of this sort may prove instructive and save much subsequent loss and discouragement. It must not be forgotten that almost every make of incubator has its peculiarities when worked under a wide variation of climatic conditions, and it can only be managed successfully with experience.

MANAGEMENT OF THE SITTING HEN.

As a great majority of readers will be rearing their chicks in nature's way a few words on the management of the sitting hen may prove useful. In the first place, the sitting hen should always be isolated from the local fowlhouse, in order to guard against vermin and prevent the other hens from disturbing her. A good plan is to make the nest in a coop with a small run covered with small-mesh wire netting, where the chickens may remain as long as the hen requires to brood them. Such a coop, about 30 in. square, made watertight, and with the lid hinged or movable, will prove very useful. The run can be made about 8 ft. long, 3 ft. 6 in. wide, and 18 in. high. Both coop and run can be readily removed to fresh ground or stored under cover in the off-season. The nest should be made on the ground and filled with fairly moist earth at least 4 in. above the ground-level; this will prevent the nest getting wet in the event of heavy rains. When forming the nest the earth should be hollowed out in the centre and lined with soft hay or pine-needles, and a sprinkling of sulphur or disinfectant given to prevent the appearance of vermin. It should also be remembered that the hen will do her duty much better and remain in better condition if dusted with insect-powder when set and a few days before hatching takes place. On no account dust the hen when the chicks are very young, or it will probably have the effect of blinding them.

It is a mistake to put too many eggs under a hen. Twelve or thirteen are in most cases as many as can be satisfactorily brooded. A medium-sized hen is to be preferred; there is less risk of the eggs being broken or the chicks being trampled to

death. It is always best to remove in the evening the hen intended for sitting. She should be placed on a few china eggs until showing that she can be entrusted with the eggs intended for hatching purposes. It must not be forgotten that the hen turns the eggs several times a day, and must have the necessary room in the nest to do this. The nest should not be made too concave, or the eggs may roll on each other during the turning process and get broken; on the other hand, it must not be too flat, or the hen may not be able to keep them all covered or under control. In the event of any eggs getting broken and the others becoming coated with the contents these should be washed in warm water, as otherwise the pores become closed, and this will interfere with their hatching-qualities. The hen is always better left to herself, with food, water, and grit placed within reach, and allowed to come off when she pleases. Sitting hens should be given grain food only, and wheat for preference. Any wet or sloppy food will cause scouring, which should be avoided if possible. At pipping-time the hen should not be interfered with; she can manage best by herself until the hatching is over. At this stage the shells may be taken away and the nest made as comfortable as possible. Care should be taken to prevent the little ones from accidents. The coops should be made both rat- and cat-proof. On no account use a deep water-tin; many a chick has been drowned owing to neglect in this matter. There is no hurry to feed the chicks for at least twenty-four hours after they are hatched. Those who have no machinery for grinding grains will find it more convenient to feed the chickens with the best commercial chicken-food on the market.

FUTURE PROSPECTS.

Owing to the hard times experienced by most poultry-keepers of late in having to purchase high-cost food and accept a declining price for their eggs, many are somewhat uncertain as to future prospects, and therefore undecided as to the number of chicks they should hatch this season. As the war is still raging, the future position is very difficult to forecast. I am inclined, however, to believe that with the prospect of a heavy harvest food-values will decline. Considering, moreover, the larger number of hens that have been killed, it appears only reasonable to assume that their missing production will be keenly felt during the summer and autumn months, and the price of eggs will increase accordingly. In any case, a large supply of eggs is required to meet the local yearly demand, and if sufficient are not produced to meet the demand it will be a difficult matter to keep out imported American eggs during

the winter season. The imported article might be shut out by bringing about a uniform price throughout the year, but this can only be accomplished by chilling or preserving the surplus local supply in the flush season for winter use.

THINGS TO REMEMBER.

The most profitable stock are those that are hatched out in August, September, and October.

One of the most common mistakes made in poultry-keeping is the hatching of a larger number of chickens than the plant will accommodate.

Always aim at cleanliness, good feeding, roomy houses, and warfare on vermin, which will add to the profits and go a long way in preventing poultry-disease.

It is poor economy to depend upon one male for the breeding-pen. It is a much saner policy to cull a drone hen than a cockerel which would make a desirable reserve sire.

Don't breed from a male that has recently been on the sick-list, or one with a weak constitution. The sire should exhibit, before anything else, a strong vigorous character.

Artificial hatching and rearing are delicate matters. It is only those who realize that it is they who are entrusted with the main responsibility, and not the inanimate apparatus, who really succeed with artificial chick-production.

The farmer should keep purebred birds of a good laying-strain, preferably a bird of self-colour; the common custom of introducing a purebred male each year to grade up a nondescript flock is a weak policy.

Aim at developing the general-purpose fowl; it is next to useless trying to breed the exceptional layer and the ideal table-carcase in the one bird. One character can only be developed at the expense of the other.

An error crept into the poultry notes published in the May issue of the *Journal*. In dealing with the treatment of worms in fowls it was stated that a 1 oz. packet of Epsom-salt should be used for every bird. This should have been "for every *dozen* birds."

THE FARM GARDEN.

W. H. TAYLOR.

VEGETABLE-CULTURE.*

ASPARAGUS should be planted as soon as the crowns show signs of activity. It is bad practice to plant too long before growth begins, because the roots being very fleshy, and a certain amount of injury in lifting being unavoidable, they are liable to decay. Though actual loss of plants may not occur, as asparagus-plants are not easily killed, yet they may be seriously weakened by loss of roots, and make a feeble start in consequence. The manner of planting is of great importance. If the roots are bunched up together the plants are likely to be lost, because the roots will mostly die. A shallow trench should be thrown out about 6 in. deep. Then with a rake draw up soil from the two sides to form a ridge along the centre. Place the crowns astride the ridge, with the roots widely spread down the sides. Thus, while the crowns are near the surface, the roots point downward. Then return the soil, and the crowns will be only 2 in, or 3 in. beneath the surface. When the plants are in active growth give a dressing of nitrate of soda, 2 oz. per square yard, so that it will be washed down to the roots. The best asparagus is grown in lines on the flat, not on raised beds. The lines may well be 3 ft. apart, and the plants nearly the same distance apart in the rows. It is most profitable so. In a famous market garden in England the plants are 4 ft. apart each way.

Seakale.—This delicate vegetable is much less grown than it should be. I should not expect it to pay as a commercial crop in this country, but for private use it is invaluable. Again, I would not advise it in a garden tilled by the owner: it involves rather much labour for a small farmer to undertake; but except for the labour there is no expense attending its culture. The manure required for forcing it is improved by being turned over. The easiest way to start a bed is by seed. Afterwards increase may be made by cuttings of the roots. The mode is to

* I wish it to be understood that these notes are intended as a guide to those who desire to cultivate their own garden — to grow vegetables, &c., for home consumption. They are not meant to apply to market gardens. They would, indeed, be practically useless for that purpose, except perhaps for a certain kind of market garden. There are two kinds of market-gardeners—one is the professional who supplies the market, the other the man who grows vegetables for sale. There is here a definite distinction. My notes may be of some help to the latter class.

dig up some roots (those as thick as a lead-pencil, or a little thicker) and cut them into 6 in. lengths, being sure to keep them all one way. The end nearest the stool from which it was cut must be kept upward. Plant them with a dibber so that the top is barely covered. Growth will come from near the top, and if more than one crown show break off all but one. These plants may be thus raised, in nurse-rows in rich soil, and be transplanted next season.

Leeks.—In some places I observe leeks are grown all the year round. This is, of course, a matter for individual taste, but my practice has always been to treat them as a winter vegetable. It appears to me that vegetables may pall on the taste if constantly in use, and at least are more appreciated if not sent to table too frequently. During summer we have peas and beans which cannot be got in winter. I consider April to October a long enough season for leeks. This period can be filled in by one sowing at mid-September. Sow in a line, not too thickly, and transplant about Christmas-time. As soon as they are large enough to be worth digging their use may begin. They will be constantly increasing in size, and a smaller number will make a dish as time goes on. The climax of growth is reached in spring, just before they go to seed, when a leek ready for cooking may weigh 2 lb.

French Beans.—These are essentially a summer vegetable. The time of sowing varies in different localities. The seed will not grow till the soil is warm, and very little frost will kill the plants. The time to sow in the Wellington Province is early October, and not before. *Runner beans* may be sown at the same time, but it is hardly wise to do so if the dwarfs succeed. Sown a month later the runners will be stronger in late autumn, when they prove valuable. In very dry places runners can be successfully grown when dwarfs may fail. The root-system of runners is strong in proportion to the top growth, hence they will run deep down into the soil, where the heat of the sun has less effect on them than it has on the flimsy roots of the dwarfs. The soil must be properly prepared, however, by deep working.

Broad beans may be sown if required. Two sowings are sufficient to supply the summer: one in June, and one in September or October. The crop is increased if the tops are pinched out when the plants are about a foot high. This causes them to throw side shoots which reach a good height. An additional advantage is that the plants are kept comparatively dwarf.

Sow Autumn Giant *cauliflower*, *Brussels sprouts*, and early varieties of *broccoli*. Brussels sprouts are to many tastes the best

of all winter vegetables. It is useless to grow them unless an early start is made, for they must have a long period of growth.

The time for sowing *cabbage* and *savoys* for winter use varies very considerably. The best time must be a matter for observation. Savoys should not come in for use till late autumn at the earliest. They are tough and unpalatable while the weather is warm. The time for sowing will vary from the 15th September to the 1st November.

Plant summer *rhubarb*. Seed of winter rhubarb may be sown at any time. Sow in rows at least 2 ft. asunder, and thin the plants to 2 ft. apart, or sow twice as close (seed is cheap) and use all the produce of alternate plants, cutting them out when those plants that are to be left demand the space. Winter rhubarb is so called because it is available for use in winter. It is really evergreen, and it is this habit of the plant that is responsible for much poor stuff being grown. If its stems are constantly pulled it gets very weak, and so it should be rested during a good part of summer.

Celeriac is a useful and delicious vegetable otherwise known as turnip-rooted celery. It is the enlargement about the roots that is used. Stewed, or in soup, it is superior to celery. Present needs are to sow seed of it in the same way as celery is sown. The main crop of the latter should now be sown.

Jerusalem artichokes should be planted at once.

Prick off seedling *tomatoes* while quite small.

FLOWER-CULTURE.

As with other things, variations in local conditions render necessary plans that are in accordance with these conditions. In some places many things of a half-hardy nature can be grown by sowing the seed in the open ground. In such places the advantage should be made use of as much as possible, for labour saved in one way can be used in another, and there is absolutely no limit to what can be done in a garden. It is, however, wise to make sure of possibilities before risking too much. Seed of the class of plants referred to—*asters*, *zinnias*, *ten-week stocks*, and the like—must not be sown till danger from frost is passed, and also there must be a certain warmth in the soil, as well as moisture. In some parts where conditions might appear favourable there is too much uncertainty about the moisture to make seed-sowing anything like sure of success. It is best in such places to raise the plants in boxes, placed in frames or greenhouses

where the latter exist. When frames or greenhouses are not available ingenuity will have to devise other means of raising the plants. It is always necessary to avoid as much as possible the watering of the soil after the seed is sown and before the plants appear. Top watering during that period in many cases ensures failure, and in most cases it modifies success. Therefore if seed be sown in boxes not in a glass structure it must be in some way protected from rain as well as from the drying influence of the wind and sun. Sheets of paper may be stretched over the boxes in such a way as to prevent contact with the soil, a sheet of glass being placed over the paper. A framework of battens covered with strong unbleached calico treated with two coats of linseed oil will form a further protection. Even when under glass the soil must be shaded to prevent its drying too quickly. There is no way better than that indicated. Even the manner of preparing the boxes of soil has an important bearing on after-success. The boxes should be shallow—first because it economizes soil, secondly because a too large body of soil in a box becomes sour, thirdly because it is necessary to fill the boxes nearly full, and deep boxes filled full of soil would be cumbersome to handle. If deep boxes are partly filled the seedlings become drawn and weak. All boxes, when there are many, should be the same depth, so that one will not shade another or impede circulation of air when this becomes necessary. They should also be the same size, so as not to waste space wherever they may be placed. The same conditions rule the economic preparation of boxes for pricking off seedlings. The best way to prepare a box is — first, to put in a good layer of strawy stable manure or sphagnum moss. The latter is to be preferred for seed-boxes and the former for seedlings, but either will answer for both purposes. Press this material firmly down, then more than fill the box with prepared soil. With a straight-edge stroke off the top soil to leave it level. Next press the surface down with a clean brick or piece of board. Seed may be sown in tiny drills made with the point of a label, or by broadcasting. As most seeds require a little covering, this is most readily effected by means of a very fine riddle. I like best a home-made one, such as perforated zinc tacked on to a frame of light batten.

Seeds that may be sown at once include all the well-known choice annuals as well as *verbenas*, *pansies*, *carnations*, &c. For edging beds and borders the dwarf *ageratums*, *Little Dorrits*, white and blue, are very effective. *Leptosiphons* are beautiful for the same purpose. These should be sown in the open ground at once. They are not tender. *Nemesias* may be sown in

the open, as frost does not injure them. *Portulacas*, particularly the doubles, are very brilliant plants. Being somewhat difficult to raise under glass by reason of a tendency to damp off, it is safest to wait for warm conditions and sow in the open ground. Plants that have been raised from cuttings, such as *pentstemons*, *calceolarias*, and like hardy plants, should be planted out at once, as well as autumn-sown seedlings of *gaillardias*, *sweet-williams*, *gypsophila*, *aubretia*, &c. For edging purposes, where there are a few plants of *cerastium* these can be largely and quickly increased. Small pieces pulled off will be more or less furnished with roots, and these placed close together in boxes of tight sandy soil are rapidly augmented, and the plants soon become fit to put out. The same applies to *arabis*. *Alyssum minima* is a useful edging-plant and is always a mass of white. Sow where the plants are to grow, or transplant as may be more convenient.

Dahlias should be divided and bedded in, to start growth before planting them out.

Young plants of *chrysanthemum* should have been secured before now. Keep them in nurse-beds till the end of October. It is best not to plant them out until it is quite necessary, because it enables the working of the soil, thus keeping it sweet.

Plant *liliums* of all kinds at once. Plant deeply in well-trenched soil. Good results need not be expected on shallow soil. The bulbs should have 8 in. or 9 in. of soil above them.

Plant autumn-flowering *gladioli* in a like manner; they should be covered by 6 in. of soil.

THE HEMP INDUSTRY.

W. H. FERRIS.

THE hemp which came forward for grading during July was generally of an inferior quality, a big increase in the proportion of "fair" grade being recorded. The very wet weather millers had to contend with had a marked effect on the hemp produced, and colour and strength suffered seriously. The prevalence also of strong winds disturbed much of the fibre in the bleaching-fields.

It is noticeable that some millers who are under contract to supply "fair" grade hemp show unnecessary carelessness—stripping too rough a fibre. In some cases the thread is badly damaged or bruised, which means that only an inferior quality is produced.

It is gratifying to note, however, that good work is being done in a number of mills, despite the unfavourable conditions. Scutching in many cases has not been as carefully carried out as it should have been. The tails of some lines are towy or knotty, this, of course, being more pronounced where the tails of the hanks have not been clipped in the field. There is no doubt that clipped tails improve the marketable quality of the hemp.

The millers of the Manawatu district are working at high pressure, and are steadily extending their operations, while progressive methods are being generally adopted. At present values the business is prospering where a good supply of leaf is available within easy distance. Millers in the Foxton district are handicapped in producing high-quality hemp by having to depend on the Manawatu River, the water of which at times, owing to floods and other causes, is not suitable for the production of fibre of a uniform colour. Several mills are working in the Marlborough District at the present time, and are turning out a very satisfactory fibre—high-point "good-fair" and "fine" grades.

During the past few weeks market prospects have been increasingly bright. In anticipation of a very big cereal harvest a keen demand for binder-twine has arisen in Australia. It is estimated that several thousand tons of New Zealand hemp will be converted into twine, and in order to cope with the demand Australian manufacturers intend running their factories at high pressure. It is recognized by the Australian consumers that phormium-fibre is equal to manila for binder-twine purposes, and our hemp has gradually taken the place of manila in Australia. It is stated that practically the whole of the binder-twine produced in the Commonwealth is now made from *Phormium tenax*.

Mr. E. H. Kinnear, representing a number of Australian cordage concerns, visited some of our principal hemp-producing districts early in August. Mr. Kinnear experienced considerable difficulty in obtaining space for shipments to Australia, but it is understood the difficulty was overcome, and that two to three thousand bales would be shipped about the middle of the month.

During the present winter months the pasture top-dressing experimental plots at Ruakura have carried eight sheep to the acre, no additional feed having been given to the animals grazing thereon. A draft of wethers from these plots sold at the Hamilton sale early in August realized 36s. per head.

JURORS EXAMINING NEW ZEALAND DAIRY-PRODUCE AT PANAMA PACIFIC EXHIBITION.

Reading from left to right: Professor Farrington, Professor Woll, Dr. Cook, Professor Wing—well-known, distinguished dairy scientists.

ANSWERS TO CORRESPONDENTS.

CORRESPONDENTS are requested, when desiring information through the Journal in regard to disease in animals and plants, to forward, where possible, affected specimens, in order to facilitate a correct diagnosis of the trouble and to ensure the best advice. In stating a question the most complete descriptive details should be furnished.

Correspondents desiring information in regard to manurial treatment of soil are requested to fill in and forward the prescribed form—"Application for Advice as to Manurial Treatment of Soil"—obtainable from any office of the Department in the Dominion.

In every instance a question to which an answer is desired in these columns must be accompanied by the full name of the inquirer, not necessarily for publication, but as a guarantee of good faith. The question should be written only on one side of the paper.

PINUS INSIGNIS.

R. A. C., Maungaturoto :—

I want to grow some *Pinus insignis* and *macrocarpa* trees from seed. Would you please let me know through the *Journal* the best way to make the seed germinate, the best time to gather the seed-cones, and the best time to sow the seed.

The Orchards, Gardens, and Apiaries Division :—

The seed-cones of *Pinus insignis* and *macrocarpa* may be gathered at any season, and if spread out on a sheet during bright sunshine and kept free from damp most of the cones will open sufficiently to release the seeds in the space of a few weeks. When the cones have opened, a good plan for extracting the seed is to half fill a sack with cones and beat it thoroughly with an iron bar, turning the bag into a new position at every stroke. The ground intended for seed-beds should be deeply dug and worked up to a fine tilth. Fine netting is needed to prevent birds picking off the seedlings as they germinate, and the beds should be covered with scrim where there is a strong sun. The seed should be sown in the early spring, and does not require soaking in hot water to hasten germination. As to the depth the seed should be planted, a safe guide is to cover seed to a depth of about double its diameter.

SUMMER FEED FOR HORSES AND COWS.

"ANXIOUS," Havelock North :—

What would be the best crop to grow for summer feed for cows and horses for use during December, January, and February? Feed is very scarce during these months. Also, should I use any manure, and, if so, what kind and quantity? What time should I put the crop in?

The Fields Division :—

The most reliable crop for your purpose is oats and tares. Select a strong-growing variety of oats such as Victory or Triumph, and drill in 2 bushels along with half a bushel of Golden tares. 1½ cwt. per acre of a mixture of superphosphate and bonedust (4 parts superphosphate to 1 part bonedust) may be applied with the seed. Sow early in August and again in October. Chou moellier as a supplementary food for cows on bare pasture is generally satisfactory. It is ready for use in about four months from sowing, and may be sown any time from August onwards. 2 lb. to 3 lb. of seed sown on ridges 27 in. apart is required, the plants being afterwards singled out to 2 ft. apart in the rows. The same manure as recommended above may be used.

STRAWBERRIES AND RED CURRANTS.

"AJAX," West Australia :—

1. Please inform me through the *Journal* if strawberries bear two crops a year, as some of mine are coming into flower in April, after having been so in October last, when I cut off all flowers to induce strong runners.

2. I have a red-currant bush on which is one bunch of red currants turning red. Is this a case of reversion to type, seeing the ancestors of this bush in Europe had berries forming in April or May; or can this out-of-season fruiting be otherwise accounted for?

The Orchards, Gardens, and Apiaries Division :—

1. It is not uncommon to pick ripe strawberries as late in the season as May. The plants very often blossom after autumn rains.

2. Fruiting trees and plants checked by drought, fire, or similar injury invariably blossom and set fruit on recovering after rains. This no doubt applies to your red-currant bush.

ARTICHOKES AS PIG-FEED.—FORAGE FOR DAIRY COWS.

"AMATEUR," Auckland :—

What is the best sort of artichokes, white or other, to plant for pig-feed? How should they be planted, and when, to get the best results in the North of Auckland? Where can I get the seed? If the pigs are allowed to help themselves and root the crop, will it grow the next year without planting again? I read somewhere that it would. Do you know of any better feed, easier grown, for pigs?

Which is the best for milking-cows as autumn feed—Buda kale or silver-beet? Does the tall rape—"Kangeru" I think it is called—give better results than Buda kale? Say how much seed to put in a square chain if seed, or are they like "spuds," and, if so, do you cut them?

The Fields Division :—

There is little to choose between the purple and white varieties of artichokes. Prepare the soil as for a potato crop, and plant the tubers in rows 30 in. to 36 in. apart, placing the tubers 36 in. apart in the rows. September would probably be the best month for planting. Manure with 1½ cwt. superphosphate and ½ cwt. blood manure. Any large seed-merchant will supply seed. Large, uncut seed is best. At least 8 cwt. per acre would be required, and the cost is not less than 12s. 6d. per cwt. Successive crops are grown from one planting by harvesting with pigs in the manner stated, allowing sufficient small tubers to remain as seed for the following year's crop. Once established they require a lot of cultivation to rid the ground of them. Artichokes have been boomed as a food for pigs at various times, but, as you will gather from the above, they are not without disadvantages. A well-grown crop of mangels is much to be preferred. Pumpkins, also, are a much more economical crop for pigs.

No exact comparative tests have been made to permit of a definite reply to your queries regarding autumn feed for cows. Silver-beet is, however, more expensive and difficult to grow. The best of this class of forage is probably chou moellier. This plant as a supplementary food for cows on bare pastures is generally satisfactory. It is ready for use in about four months from sowing, and may be sown any time from August onwards. 2 lb. or 3 lb. of seed sown on ridges 27 in. apart is required, the plants being afterwards singled out to 2 ft. apart in the rows. 1½ cwt. per acre of a mixture of superphosphate and bonedust (4 parts superphosphate to 1 part bonedust) may be applied with the seed.

MAKING GRAFTING-FLUID.

L. A. M., Hastings :—

Kindly oblige by furnishing information *re* the making of grafting-fluid (not grafting-wax), the stuff being unobtainable from seedsmen in the district.

The Orchards, Gardens, and Apiaries Division :—

Grafting-fluid is prepared as follows: Best white resin, 1 lb.; beef tallow, 1 oz. Heat till dissolved, remove from fire, and add 8 liquid ounces of alcohol, and mix well. Keep in closed bottles or cans.

FEEDING CALVES.

"SUBSCRIBER," Palmerston North :—

Please inform me what quantities of raw linseed you would advise as the most profitable to use when feeding calves with whey. Is it preferable to boil the whey when it is not to be had fresh daily, or is there any other safe way of destroying the acidity of it ?

The Live-stock and Meat Division :—

Linseed may be fed to calves at the rate of 4 oz., increasing to ½ lb. or ¾ lb., per day. Whey should only be fed to calves in its fresh state. If it cannot be given in this way it should not be fed at all. There is no safe way of neutralizing the acidity.

PLANTING POTATOES IN ORCHARD.

D. ELLWOOD, Christchurch :—

I have a few acres that were planted last year with young apple-trees 17 ft. apart both in the rows and between each row. Would the young trees suffer if I planted potatoes between the rows ? If not, how many rows of potatoes would you advise between each row of fruit-trees, and what mixture and quantity of manure per acre ? The land is from light to medium light.

The Orchards, Gardens, and Apiaries Division :—

Four or five rows of potatoes can be planted between the young trees without injury so long as the soil is kept well worked. Manure in the proportion of 2 of superphosphate to 1 of sulphate of potash, and apply at the rate of 3 cwt. per acre. 1 cwt. to 2 cwt. of blood and bones per acre may be used as a top-dressing before moulding up.

FERTILIZER FOR FRUIT-TREES.

ARTHUR VINCENT, Westport :—

What is the best fertilizer for young fruit-trees ? The soil is of clay chiefly.

The Orchards, Gardens, and Apiaries Division :—

I would advise you to manure your trees with a mixture of 3 of basic slag and 1 of sulphate of ammonia, using from 3 lb. to 4 lb. per tree. Your soil would probably be improved if dressed with 10 cwt. to 15 cwt. of agricultural lime (burnt and water-slaked lime).

PRUNING PEACH-TREES.

"INQUIRER," Canterbury :—

Would it be injurious to peach-trees to cut off large branches while trees are dormant if plenty of young branches are left to carry the sap when it rises in the spring ?

The Orchards, Gardens, and Apiaries Division :—

This is a common practice of renewing old trees. The only thing to be feared from such treatment is an attack of silver-blight. To avoid this danger as much as possible paint with ordinary paint or coal-tar over all wounds made.

APPRECIATION.

"I must congratulate you on the *Journal*. The Department was created in the interests of farmers, and it would be useless to go into costly researches and experiments without putting the knowledge and results at the farmers' disposal. By your publication of the *Journal* at the small subscription of 2s. 6d. per annum you are conferring a great benefit on the farming community. It is the duty of all farmers in the Dominion to subscribe to it and avail themselves of the information contained in this publication."—*A. C. R., Hatuma Homestead.*

"A most wonderfully cheap and yet the very best of Journals it is possible to produce."—*P. H. J., Mount Torlesse.*

COMMERCIAL INTELLIGENCE.

RYE-GRASS AND COOKSFOOT SEED.

ALL things considered, the prospects of the grass- and clover-seed trade must be considered satisfactory. From the farmers' point of view the high price of the staple ingredients of grass mixtures is regrettable, but this is counterbalanced by the excellent prices obtaining for the produce from grass land. The high prices are partly due to the abnormal conditions arising from the war, but the past dry season in the Dominion, resulting in a shortage in the local supply, has been of far greater significance. In normal seasons New Zealand produces supplies ample for all local requirements of the two dominant grass-seeds used in our pasture-formation—rye-grass and cocksfoot. Over three-fourths of the pasture seeds so used consist of these grasses. Had it therefore not been for the great shortage in the local crops the prices of the bulk of the seed used would not have been higher than usual; in fact, owing to the high freights limiting exportation, the prices might easily have been low. Luckily, large importations, rendered possible by the sharp rise in prices of both rye-grass and cocksfoot, have been made, and supplies are now quite adequate for all requirements until the local 1916 crop is available.

The rye-grass imported has been mainly of Irish origin, and is of excellent quality, being superior in germination to the average local seed, and splendidly machine-dressed. The present price of the heavier-weight imported seed is about 5d. a pound, being about 100 per cent. dearer than that of southern seed in normal seasons.

The greater part of the imported cocksfoot is of Danish origin, and is, on the whole, far superior in both germination and purity to local seed. Many lines that have been tested show a germination of over 90 per cent. As this seed is being retailed at the same price—roughly, 1s. a pound—as the better lines of locally grown seed, it is really cheaper than the latter when quality is taken into account. It is unlikely that any considerable importation of Danish cocksfoot will take place from now onward, as much of the land previously devoted to this crop has been this season used for the growing of cereals, and in consequence the cocksfoot-production in Denmark is comparatively small.—*A. H. Cockayne.*

FRUIT-MARKETS IN SOUTH AMERICA.

THE report received by the Department from Mr. G. L. Tacon, as referred to in the July issue of the *Journal*, has now been published as a bulletin, copies of which may be obtained gratis on application in the usual way.

Mr. Tacon deals fully with all sides of the subject, and presents his conclusions regarding markets as follows: "The total market in Argentina, Uruguay, and Brazil for the average class of apples from New Zealand is at present about 150,000 cases, in round numbers. If, however, our apples are graded carefully for quality, and packed to standard on the American system and with reliable uniformity equal to American, then I believe that we could depend upon a market for at least 200,000 cases. I should expect the demand to increase year by year, from a gradual retail cheapening of fruit, and a widening popularity for the apple, and a general tendency in South America towards a higher living-standard, all combined with a growing population. The market is not unlimited as we in New Zealand have been sometimes led to believe, and our main export outlets for ordinary-size apples must be looked for in the Northern Hemisphere. South America, however, appears to me likely to be particularly valuable as providing a highly profitable market in future years for off sizes—for dessert apples above

2¾ in.—which would be too large for Northern Hemisphere markets. The great size of these cities is no criterion of the demand for our fruit. The great bulk of the people are very poor; they are frugal, and live as cheaply as possible. At present only those of the better class can afford to buy our apples. But tendencies and influences are at work which promise to improve the living-conditions of the people. And every improvement which tends to lessen the cost of living there will benefit by giving us a wider market. There is a fine demand for pears whenever we can ship successfully."

The methods of marketing fruit in the three principal importing centres of Buenos Aires, Montevideo, and Rio de Janeiro are described, and notes are furnished regarding the leading firms in the fruit trade in those cities. Names are also given of reliable firms who would purchase fruit in New Zealand or c.i.f., or receive on consignment.

Regarding the prospect of a development of pip-fruit growing in Argentina which would tend to restrict the demand for outside supplies, Mr. Tacon thus summarizes his investigations: "Pears can, I believe, be grown successfully at Tigre Islands and elsewhere; but I am doubtful of apples in any part of the country at present opened up by the railway, for the reasons (climatic, &c.) hereinbefore given. In new countries like Argentine, with virgin soil and unlimited areas of cheap land, the investing class is adverse to sinking a comparatively large capital in small areas whence no return is possible for many years; they can get a prompt and high annual return from cereals, stock, &c., and have many other avenues of profitable investment in businesses which they understand. Small people are unable to undertake apple-growing in Argentine even if they wish; they cannot afford to wait five to seven years for returns, with continuous outlay, and no means of earning a livelihood in that waiting-period. And they do not understand apple-growing in Argentine; vines and peaches they are accustomed to and know, but not apples; and the Italian peasant class, which does most of the intensive farming in South America, is not given to experimenting."

SALE OF NEW ZEALAND FRUIT AT SAN FRANCISCO.

REPORTING under date 23rd June on a small shipment of thirty-one cases of apples and pears forwarded to San Francisco in May last, Mr. E. Clifton, New Zealand Commissioner, states as follows:—

This shipment did not open up in satisfactory condition, it being found necessary to cull ten cases, as follows: Josephine pears, four cases; Winter Nelis pears, two cases; P. Barry pears, two cases; Rome Beauty apples, one case; Dougherty apples, one case. Of the pears, the Winter Nelis arrived in best condition, and the seven cases sold realized an average price of $3.25. The five cases of P. Barry pears were in riper condition generally than the Winter Nelis, and realized an average of $2.10 per case. Of the apples, Rome Beauty brought $2 per case, Sturmer Pippin $2.25, and Dougherty $2, per case. Considering the fact that this market is still overloaded with last season's apples in cold storage, these prices must be regarded as very satisfactory.

NEW ZEALAND FRUIT IN LONDON.

A SMALL trial shipment of four cases each of apples and pears forwarded by the Department in April last arrived in London in excellent condition, with the exception of one case of Beurre Bosc pears, all of which were rotten. Two cases of P. Barry pears realized 30s. per case, while a case of Winter Nelis pears brought 27s. The apples sold as follows: One case Monroe's Favourite, 21s.; one case Jonathan, 20s.; one case Jonathan, 18s.; one case Delicious, 18s. The fruit was sold to Harrod's Stores (Limited), Brompton, where it was displayed and exhibited as New Zealand fruit. There the pears and apples were sorted according to size, and were retailed at the following prices per dozen: Pears—P. Barry, 12s. 6d. to 15s.; Winter Nelis, 8s. 6d. to 10s. 6d. Apples—Monroe's Favourite, 6s.; Jonathan's, 4s. 6d. to 6s.; Delicious, 6s.

The High Commissioner in reporting the sale remarks: "It is decidedly encouraging to find that New Zealand apples and pears, when landed in this country in good order and condition, realize such satisfactory prices. The grading and packing of the small shipments recently received by me have been thoroughly satisfactory. It is to be regretted that similar care does not appear to be exercised by shippers in the Dominion in the preparation of the ordinary shipments sent forward for sale. I believe it would pay to give the matter of grading and packing more attention than it has hitherto received. The prices paid by purchasers at this end should much more than compensate shippers for the greater cost incurred in preparing their shipments."

THE 1915 WHEAT CROP.

In the June number of the *Bulletin of Agricultural and Commercial Statistics*, published by the International Institute of Agriculture, forecasts of the 1915 wheat crop are given for certain countries in the Northern Hemisphere where the harvest was already in progress or would soon be commencing. The production is estimated in Italy at 55,000,000 quintals (119·3 per cent. of that of last year), in Switzerland at 1,029,000 quintals (115·4 per cent.), in the United States for winter and spring wheat together at 258,552,000 quintals (106·6 per cent.), and in Japan at 6,442,000 quintals (109·4 per cent.). In the other countries for which information had been received (Bulgaria, France, Great Britain and Ireland, Roumania, Canada), although forecasts of the crops were not given, conditions were generally favourable for the coming harvest. More especially is to be noted the great increase this year, compared with 1914, in the area sown to wheat in Canada (5,218,753 hectares, against 4,165,006 in 1914, or 125·3 per cent.).

REGISTRATIONS OF FACTORIES, ETC., UNDER THE DAIRY INDUSTRY ACT, 1908.

REGISTRATIONS AS AT 30TH APRIL, 1915.

Province.	Creameries (Butter).	Factories (Cheese).	Private Dairies (under 50 Cows).		Packing-houses (Milled Butter).	Totals.
			Butter.	Cheese.		
Auckland	53	24	6	6	11	100
Taranaki	40	98	50	2	3	193
Wellington ..	27	55	5	2	24	113
Hawke's Bay ..	10	19	..	..	..	29
Nelson	7	4	2	1	13	27
Marlborough ..	4	7	..	..	..	11
Westland	7	3	..	..	..	10
Canterbury ..	11	15	1	11	8	46
Otago and Southland	8	105	..	2	4	119
Totals ..	167	330	64	24	63	648

REGISTRATIONS.

1914	181	293	100	23	64	661
1915	167	330	64	24	63	648

THE DOMINION'S EXPORTS TO BRITAIN.

COMPILED FROM MANIFESTS OF VESSELS SAILED DURING RESPECTIVE MONTHS OF CURRENT AND PRECEDING SEASONS.

Month.		Mutton, Carcases.	Lamb, Carcases.	Beef, Quarters.	Pork, Carcases.	Butter, Boxes.	Cheese, Crates.	Wool, Bales.	Wheat, Sacks.	Oats, Sacks.	Rabbits, Crates.	Hemp, Bales.	Tow, Bales.	Kauri-gum, Cases.
January,	1915	137,816	296,439	45,622	339	138,081	85,123	87,393	..	..	2,860	683	..	1,209
,,	*1914*	*231,766*	*464,185*	*30,424*	*33*	*150,492*	*136,086*	*108,742*	..	*500*	*2,851*	*15,234*	*4,306*	*11,133*
February,	1915	433,585	517,581	77,421	311	119,371	96,090	159,347	..	..	..	13,111	6,619	2,763
,,	*1914*	*354,190*	*334,207*	*14,100*	*3*	*86,570*	*59,532*	*127,372*	..	*4*	..	*3,709*	*633*	*7,607*
March,	1915	80,439	203,480	30,176	..	55,280	51,811	49,809	..	..	..	8,410	185	274
,,	*1914*	*446,522*	*551,313*	*36,689*	..	*61,060*	*62,732*	*95,175*	..	..	..	*8,187*	*2,562*	*3,958*
April,	1915	286,155	328,779	45,340	..	6,703	38,561	41,371	..	..	1,011	9,328	1,474	3,461
,,	*1914*	*234,765*	*366,786*	*22,185*	..	*7,822*	*63,796*	*58,488*	..	*2,901*	..	*1,247*	*888*	*5,909*
May.	1915	257,953	433,831	34,780	655	148	17,065	21,615	..	..	2,923	4,968	808	2,636
,,	*1914*	*336,632*	*638,397*	*39,315*	*54*	*837*	*37,776*	*43,364*	*3,623*	*11,062*	..	*8,355*	*2,112*	*9,316*
June,	1915	99,080	154,785	19,316	932	..	26,869	11,946	..	..	9,800	5,027	1,320	1,229
,,	*1914*	*261,877*	*634,981*	*36,400*	..	*1,153*	*19,247*	*18,774*	..	*28,141*	*1,000*	*7,924*	*4,258*	*7,881*
July,	1915	243,420	340,476	21,231	154	..	21,520	16,039	..	..	5,968	5,068	1,639	4,184
,,	*1914*	*225,411*	*239,143*	*38,170*	..	*1,355*	*2,003*	*15,868*	..	*1,425*	*1,000*	*5,810*	*2,584*	*8,053*
August,	1914	4,251	63,111	19,094	516	1,979	50	4,845	600	38,220	10,403	367	245	3,705
,,	*1913*	*161,593*	*178,263*	*13,129*	*6*	*8*	*407*	*8,494*	*11,604*	*45*	*38,480*	*3,714*	*2,310*	*6,406*
September,	1914	3,386	49,200	2,353	..	15,885	..	3,337	..	5,896	7,288	1,143	57	..
,,	*1913*	*133,122*	*83,521*	*5,334*	*16*	*6,575*	*2,020*	*7,176*	..	..	*16,336*	*3,826*	*1,501*	*10,049*
October,	1914	291,432	128,016	49,104	..	81,842	30,487	8,938	..	68,660	38,121	2,042	1,650	1,683
,,	*1913*	*14,122*	*25,735*	*580*	..	*42,847*	*21,452*	*2,705*	..	..	*10,020*	*6,986*	*3,672*	*2,923*
November,	1914	136,346	27,577	48,302	27	98,729	70,048	37,604	15	24,289	35,783	885	110	1,377
,,	*1913*	*20*	*1,479*	..	..	*53,468*	*23,722*	*1,891*	..	..	*2,478*	*4,162*	*771*	*2,314*
December,	1914	192,952	149,835	44,876	..	172,990	80,114	86,317	..	..	9,306	1,136	116	2,157
,,	*1913*	*128,087*	*86,890*	*8,909*	..	*249,526*	*124,821*	*51,385*	..	*250*	*24,479*	*19,807*	*5,276*	*11,273*

LONDON MARKET VALUES.

COMPARATIVE STATEMENT COMPILED FROM THE HIGH COMMISSIONER'S CABLES FOR THE PAST THREE MONTHS.

London Date.	Wool. Bradford Quotations for Tops. 36's.	40's.	44's.	50's.	56's.	60's.	Mutton. Canterbury.	Mutton. North Island.	Lamb. Canterbury.	Lamb. Other than Canterbury.	Beef. New Zealand Hinds.	Beef. New Zealand Fores.	Butter. Danish.	Butter. New Zealand.	Cheese. New Zealand White.	Cheese. New Zealand Coloured.	Cheese. Canadian.	Hemp (Spot). New Zealand Good-fair.	Hemp (Spot). New Zealand Fair.	Hemp (Spot). Manila Fair Current.*	Hemp (Forward Shipment). New Zealand Good-fair.	Hemp (Forward Shipment). New Zealand Fair.	Hemp (Forward Shipment). Manila Fair Current.*	Wheat. Short-berried.	Wheat. Long-berried.	Oats. Sparrowbills.	Oats. Danish.
1915.							d.	d.	d.	d.	d.	d.															
May 1	..	..	..	..	..	..	6½	6 1/16	7	..	6⅝	6½	146/0	136/0	94/0	94/0	98/0	32/10/0	30/10/0	39/0/0	31/10/0	30/0/0	..	..	..	..	..
„ 8	..	..	..	..	..	..	6½	6 1/16	7⅛	7	6⅝	6½	154/0	140/0	94/0	94/0	98/0	33/0/0	31/0/0	39/10/0	32/10/0	30/10/0	..	..	..	..	..
„ 15	..	..	..	..	..	..	6½	6 1/16	7 15/16	..	..	..	156/0	144/0	95/0	94/0	98/0	32/10/0	30/10/0	39/0/0	32/0/0	30/0/0	38/0/0	..	..	..	..
„ 22	..	..	..	..	..	..	6⅝	6⅝	8	7⅞	7¼	6½	156/0	146/0	94/0	94/0	98/0	33/0/0	31/0/0	39/10/0	32/10/0	30/10/0	39/0/0	..	..	..	..
„ 29	..	..	..	..	..	..	6¾	6⅝	8¼	8⅛	..	..	150/0	144/0	100/0	100/0	..	32/10/0	30/10/0	39/0/0	32/0/0	30/0/0	38/10/0	..	..	..	..
June 5	..	..	..	..	..	..	7	..	8⅜	8⅜	8	6⅞	148/0	142/0	100/0	100/0	98/0	32/10/0	30/0/0	39/0/0	32/0/0	29/10/0	39/0/0	..	..	..	..
„ 12	2/1	2/2	2/3⅛	2/7½	2/9½	3/1	7	7	8⅜	8⅝	..	..	149/0	142/0	98/0	97/0	97/0	32/10/0	30/10/0	39/0/0	..	..	..	..	..	..	..
„ 19	..	..	..	..	..	..	7⅛	7⅛	8⅜	8⅜	8	7	149/0	142/0	94/0	93/0	94/0	32/10/0	30/10/0	38/10/0	31/15/0	29/10/0	38/0/0	..	..	..	..
„ 26	..	..	..	..	..	..	7¼	7⅛	8⅜	8⅜	..	..	152/0	144/0	96/0	94/0	93/0	32/10/0	30/10/0	38/10/0	31/15/0	29/10/0	38/0/0	..	..	..	..
July 3	..	..	..	..	..	..	7¼	7⅛	8⅜	8⅜	..	..	154/0	146/0	94/0	93/0	90/0	32/0/0	30/0/0	38/10/0	31/10/0	29/10/0	36/10/0	..	..	35/0	..
„ 10	..	..	..	..	..	..	7¼	7⅛	8½	8⅜	7½	6¾	158/0	..	93/0	92/0	88/0	32/0/0	30/0/0	37/0/0	31/0/0	29/10/0	36/10/0	..	..	..	..
„ 17	..	..	..	..	..	..	7¼	7⅛	8½	8⅜	..	..	160/0	..	84/0	82/0	84/0	31/10/0	29/10/0	..	31/0/0	29/0/0	36/10/0	..	..	..	..
„ 24	..	..	..	..	..	..	7 3/16	7	8⅜	8 5/16	..	..	166/0	..	78/0	76/0	76/0	31/10/0	29/10/0	..	31/0/0	29/0/0	36/0/0	..	..	..	..
„ 31	..	..	..	..	..	..	7⅛	7	8⅜	8½	7½	6¾	166/0	..	76/0	74/0	76/0	31/10/0	29/10/0	..	..	..	36/0/0	..	..	..	..

* New grade "Fair" quoted since 10th July.

HEMP AND TOW GRADING RETURNS.

JULY.

Hemp.—The total number of bales graded was 7,697, as compared with 4,080 for the corresponding month of last year, an increase of 3,617 bales. For the twelve months ending 31st July, 1915, the number of bales graded was 89,858, as compared with 129,469 for the previous twelve months, a decrease of 39,611 bales.

Tow.—During the month 2,047 bales were dealt with, as compared with 1,482 for the corresponding month of last year, an increase of 565 bales. For the twelve months ending 31st July, 1915, the number of bales graded was 23,753, as compared with 41,940 for the previous twelve months, a decrease of 18,187 bales.

Stripper-slips.—During the month the number of bales graded was 120, as compared with 35 for the corresponding month of last year, an increase of 65 bales. For the twelve months ending 31st July, 1915, the number of bales graded was 1,675, as compared with 3,560 for the previous twelve months, a decrease of 1,885 bales.

HEMP, TOW, AND STRIPPER-SLIPS GRADED THROUGHOUT THE DOMINION DURING THE MONTH OF JULY, 1915.

Hemp.

Port.	Superior.	Fine.	Good-fair.	Fair.		Common.	Rejected.	Condemned.	Total.
				High Point.	Low Point.				
	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.
Auckland ..	..	..	142	509	726	229	7	6	1,619
Napier ..	..	..	..	96	..	2	..	..	98
Foxton ..	..	..	365	1,541	244	48	12	..	2,210
Wellington ..	..	30	440	1,839	686	23	23	..	3,041
Blenheim ..	..	..	59	47	..	..	..	..	106
Picton ..	..	17	29	67	..	..	..	..	113
Lyttelton ..	..	..	..	..	..	..	..	..	..
Dunedin ..	..	..	65	55	50	..	..	..	170
Bluff	..	..	111	123	103	3	..	..	340
Totals ..	..	47	1,211	4,277	1,809	305	42	6	7,697
Percentages of totals	..	0·62	15·73	55·55	23·50	3·97	0·55	0·08	..

Tow.

Port.	First Grade.	Second Grade.	Third Grade.	Condemned.	Total.
	Bales.	Bales.	Bales.	Bales.	Bales.
Auckland ..	10	112	335	32	489
Napier	30	..	..	..	30
Foxton ..	132	246	78	4	460
Wellington ..	242	352	57	8	659
Blenheim ..	..	61	..	..	61
Picton	..	50	..	..	50
Lyttelton ..	..	..	..	..	..
Dunedin ..	..	..	58	..	58
Bluff	36	69	134	1	240
Totals ..	450	890	662	45	2,047

Stripper-slips.—Foxton: Second grade, 58. Wellington: Second grade, 27; condemned, 16. Blenheim: Second grade, 19.

STOCK EXPORTED.

THE following table shows the numbers and descriptions of stock exported from the Dominion during the month of July, 1915:—

Port of Shipment.	Horses.			Sheep.			Cattle.		Pigs.		Dogs.		
	To Australia.	To Eastern Pacific.	To Montevideo.	To Australia.	To Eastern Pacific.	To South America.	To Australia.	To Eastern Pacific.	To Australia.	To Eastern Pacific.	To Australia.	To Eastern Pacific.	To United Kingdom.
Auckland ..	..	1	..	..	223	..	..	20	..	47	2	2	..
Gisborne ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Napier ..	..	..	..	1	..	..	..	..	..	..	..	..	..
Wellington ..	2	..	..	..	50	..	..	..	..	..	20	..	..
Lyttelton ..	5	..	..	63	..	..	..	..	..	..	5	..	..
Dunedin ..	21	..	..	843	..	..	..	..	..	..	..	..	..
Bluff ..	7	..	..	..	..	..	..	..	..	..	1	..	..
Totals ..	37	1	..	907	273	..	..	20	..	47	28	2	..

Particulars of the horses shipped: Draughts, 12 mares, 3 geldings, 15 colts; 2 Clydesdale colts, 2 thoroughbred stallions, 2 geldings, 1 filly.

Three crates of poultry were also shipped from Auckland to the eastern Pacific.

STOCK IN QUARANTINE.

THE following stock was received into quarantine during the month of July, 1915:—

No.	Description.	Sex.	Port of Origin.	Owner or Agent.	Address.
		MOTUIHI ISLAND (AUCKLAND).			
1	Irish terrier ..	Male ..	London ..	New Zealand Express Company	Auckland.
1	,, ..	Female	,, ..	Ditto	,,
		SOMES ISLAND (WELLINGTON).			
		Nil.			
		QUAIL ISLAND (LYTTELTON).			
		Nil.			